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Talk to any business man for fifteen minutes and if you are not convinced that his particular business is the hardest one in which to make a living it isn't his fault. When it comes to the machine tool builder, he can tell you a tale of woe that beggars description. Unfortunately, there is no exaggeration in his story, he can quote figures to prove it. Here are some of the figures and an analysis of them by Dr. Mitchell who is well known as an authority on business cycles. In conclusion he gives some recommendations as to what may be done to ameliorate the severity of the machine tool builders' difficulties.

# The Business Hazard in the Machine Tool Industry

**By Wesley C. Mitchell**

Census figures show machine tool builders to be worst sufferers from business depressions—Need of the industry for comprehensive statistics—Business executives replacing mechanical men

THERE is one sentence in the recent census bulletin on machinery which everyone connected with the machine-tool industry should keep in mind for frequent use. "This industry," says the Census, "shows for the period 1919-21 a greater reduction in activity than has been recorded for almost any other line of manufacture."

Here is confirmation of an opinion which many machine tool builders have long held. In every period of business depression, observant men in the industry have claimed that they suffered more than any other class of producers from shrinkage of demand. Of course they could not prove this proposition: it remained a matter of opinion and was easily forgotten when times grew better. Now, however, the highest authority has shown on the basis of systematic comparisons among all manufacturing industries that, in the latest depression at least, the machine-tool business really did fare worse than "almost any other." Many an old-time practical man has a right to say, 'I told you so."

A few examples taken at random from recent bulletins of the 1921 Census of Manufactures will show the relative severity of the depression in different industries as measured by the value of the products. See Table I.

Machine tools it will be noticed show a heavier loss in value of products than any other industry on the list except shipbuilding. Everyone knew that shipbuilding must decline greatly from the scale which it attained under our war program. We don't expect to build ships in peace time at the rate required to offset submarine sinkings and to maintain an army on the other side of the Atlantic. If the comparison is made with 1914 instead of 1919, the machine-tool industry appears far harder hit than shipbuilding. Even after suffering the 75 per cent drop from 1919 the value of the ships built in 1921 remained 352 per cent of the value built in 1914. The Census gives us no separate figures for machine tools before 1919: but we may be very sure that the output in 1921 was not much larger than in 1914. Probably it was less in the post-war depression than in the pre-war depression.

### Machine Tools in Earlier Depressions

There can be no question, then, that the machine-tool industry suffered to an extreme degree in 1921. But are these census comparisons for 1919-21 typical of the effect of business depression upon the machine-tool industry? Most producers expect that future depressions will bring such drastic curtailment of business as they recently suffered? Or can they dismiss the collapse of 1921 from their reckoning as primarily an after effect of the war?

There is no doubt that the depression of 1921 was exceptionally severe for industry as a whole, and therefore exceptionally severe for the machine-tool trade in particular. Indexes of employment are perhaps the best available measures of industrial activity, and the best such series for the United States makes the decline of employment in 1921 almost twice that in 1908; the previous record year for the period covered by the date.[1] The indexes of production tell a similar story. Clearly we need not take the depression of 1921 as a "normal case." The machine-tool industry is not likely to suffer so severely again—until the country has passed through another great war.

[1]William R. Berridge, Cycles of Unemployment in the United States, Boston, 1923; p. 52.

But while the industry need not fear a frequent repetition of the worst, it must be prepared to expect a curtailment of sales in each and every period of depression more severe than overtakes almost any other industry. While we have no census figures for earlier depressions to bear out this statement it is supported by the theory of business cycles, the observation of practical men, and by such statistics as are available.

**Table I—Census Figures Showing How 1921 Depression Affected Various Industries**

| Industries as Reported by the Bureau of Census | Percentage Change in Value of Products 1919—'21 |
|---|---|
| Petroleum refining | + 5.8 |
| Textile machinery | + 5.6 |
| Bread and other bakery products | — 4.6 |
| Electrical machinery, apparatus and supplies | —16.4 |
| Confectionery and ice cream | —16.8 |
| Paint and varnish | —19.4 |
| Soap | —24.2 |
| Lumber | —28.0 |
| M or vehicles | —32.5 |
| Machinery, all kinds | —32.6 |
| Steam and electric railroad cars and repair shops | —38.8 |
| Chocolate and cocoa products | —41.4 |
| Flour-mill products | —42.5 |
| Natural dye stuffs and extracts | —47.3 |
| Slaughtering and meat packing | —48.2 |
| Smelting and refining non-ferrous metals | —55.8 |
| Machine tools | —68.1 |
| Shipbuilding | —75.3 |

The figures in question have been compiled by Mr. Ernest F. Du Brul who combines statistical technique with practical knowledge of the industry. While not so extensive as the compiler would like, they are believed to be fairly representative of the trend of production in good times and bad. Mr. Du Brul has been able to secure 29 series of reports which show for each year since 1901 the numbers of standardized machine tools of five types shipped by different makers. In Table II the data for the last full year before the war indicate sufficiently the scope of his tables.

**Table II—Shipments of Certain Machine Tools in 1913**

| Type of Machine Tool | Number of Reports | Number of Machines Shipped in 1913 |
|---|---|---|
| Radial drills | 3 | 671 |
| Upright drills | 6 | 4,456 |
| Shapers | 6 | 1,346 |
| Universal milling machines | 7 | 1,205 |
| Plain horizontal milling machines | 7 | 1,734 |
| Total | 29 | 9,412 |

For the present purpose it is sufficient to take merely the total numbers of all these tools shipped, and to give even these totals only for the years that mark the successive peaks and troughs of the business cycle. The best standard of comparison to set beside these figures is the annual production of pig iron—a series that is widely known for its extreme fluctuations. This has been done in Table III. From this simple arrangement we can get a clear idea both of how the machine-tool trade has fared in successive depressions, and of how large are its swings in comparison with those of the basic iron industry.

These figures confirm the conclusion that the drop from 1919 to 1921 was exceptionally severe, despite the fact that 1919 was not a peak year in either the iron or the machine-tool industry. What is more important, the figures indicate that both on the down swing and on the up swing, fluctuations are even more violent in the machine-tool industry than in the iron industry. To this rule there is no exception so far as our data go. And the difference in the amplitude of fluctuations is often very wide.

### How the Industry Can Reduce the Business-Cycle Hazard

The general conclusion which these facts support may be put in this way: the machine-tool industry is subject to an exceedingly large business-cycle hazard. Perhaps we should say with the census that this hazard is larger in machine-tool building than in "almost any other line of manufacture."

If that is the case, what can the machine-tool builders do to protect themselves?

Their first and most obvious measure of self-defense is to realize the danger clearly and to use the utmost caution against being caught unawares. As said above, many machine-tool men have recognized the extreme fluctuations of the demand for their product in a general way. Doubtless some producers have always kept this fact in mind when planning production, contracting for supplies, and setting prices on their products. But I cannot believe that the industry as a whole has made effective use of its occasional insights. For, if the industry had been fully and continually alert to the danger, the National Machine-Tool Builders Association would have developed by this time the fullest statistical service of any trade association in the country, and would have given its closest attention to methods of forecasting changes in general business conditions. There is no industry which has more pressing need for full, regular, up-to-date information about stocks of materials, work in progress, finished products, shipments, and orders. But so far as I can learn, there are few industries which have such fragmentary statistics. Of course the technical difficulties in the way of compiling data upon highly specialized products like machine tools are considerable. Yet a little of the ingenuity which goes into the designing of the machines would find ways through or around these difficulties. To an outsider it seems that not ability but will is lacking. The men who have been urging co-operation by all establishments to reduce the business-cycle hazard common to them all have not received the active support which is necessary for success. So long as matters run on as now, every new depression will bring a needlessly long list of bankruptcies in the machine-tool industry. And nobody but the machine-tool men themselves can do much to reduce their losses. Perhaps they will pay better attention to their own interests

**Table III—Fluctuations in Production of Pig Iron and in Shipments of Certain Machine Tools Between Peaks and Troughs of Business Cycles Since 1902**

| | Pig Iron Produced Million Tons | Machine Tools Shipped, Number | Percentage Pig Iron | Rise or Fall Machine Tools |
|---|---|---|---|---|
| Peak 1902 | 17.8 | 8,268 | ..... | ..... |
| Trough 1904 | 16.5 | 6,671 | — 7% | — 19% |
| Peak 1907 | 25.8 | 11,768 | +56% | + 76 |
| Trough 1908 | 15.9 | 4,998 | —38 | — 58 |
| Peak 1910 | 27.3 | 10,356 | +72 | +107 |
| Trough 1911 | 23.6 | 8,319 | —14 | — 20 |
| Peak 1912 | 29.7 | 10,687 | +26 | + 29 |
| Trough 1914 | 23.3 | 6,362 | —22 | — 40 |
| Peak 1917 | 38.6 | 18,548 | +66 | +192 |
| Census Year 1919 | 31.0 | 14,154 | —20 | — 24 |
| Trough 1921 | 16.7 | 1,747 | —46 | — 88 |

now that the Bureau of the Census has begun telling them what they already know. Human nature often works in that illogical way.

If every establishment in the industry received each month a trustworthy report showing the fluctuations in stocks of materials, work in progress, finished products, shipments and orders—a report giving totals for the industry and perhaps some of its subdivisions, but not data for individual companies—then every manager could make far more intelligent plans than any manager can now make. There would be much less danger of getting caught with large inventories or heavy commitments on the eve of a depression. To reduce the number of ruinously bad mistakes made every few years seems a modest ambition. To achieve that much in the machine-tool industry requires merely intelligent cooperation in the compiling and using of simple statistics.

### The Difficulty of Stabilizing Production

How far the industry can go beyond this policy of eternal vigilance in guarding against errors is not clear. Other industries seem able to stabilize production in some measure by making for stock, by getting advance orders, by advertising more freely in hard times, by developing new products or by cutting prices to stimulate demand. But so far as I can see the opportunities to apply such stabilizing devices in the machine-tool business are limited. To influence the demand for industrial equipment is far harder than to influence the demand for family supplies. Whether producers in other lines will buy more machine tools or not depends upon the volume of business these men have in sight, rather than upon any inducements which the machine-tool builders can offer. Obviously the machine-tool men can exercise little influence upon the demand for the products made with their machines. Sometimes it may be possible to get business in a depression by bringing out improved models, and the policy of saving up new designs for launching at such times deserves consideration. But even this device is probably less effective in the market for industrial equipment than in the market for consumers' goods.

On the possibility of stimulating demand by cutting prices we have a little definite information. Mr. K. H. Condit has kindly put at my disposal the data on the production or sales of four machine tools and their prices for the years 1913-22 shown in Table IV.

**Table IV—Production or Sales and Price of Machine Tools by Years, 1913-1922**

| | First Type | | Second Type | | Third Type | | Fourth Type | |
|---|---|---|---|---|---|---|---|---|
| | No. of Machines Built | Price | No. of Machines Built | Price | No. of Machines Shipped | Price | No. of Machines Sold | Price |
| 1913 | 77 | $700 | 148 | $300 | 40 | $1,400 | 162 | $870 |
| 1914 | 58 | 700 | 94 | 300 | 31 | 1,400 | 92 | 870 |
| 1915 | 133 | 700 | 258 | 300 | 54 | 1,495 | 458 | 980 |
| 1916 | 140 | 930 | 197 | 395 | 59 | 1,756 | 245 | 1,180 |
| 1917 | 155 | 1,600 | 191 | 620 | 108 | 2,330 | 343 | 1,230 |
| 1918 | 150 | 1,760 | 185 | 620 | 242 | 2,700 | 470 | 1,470 |
| 1919 | 137 | 1,600 | 241 | 540 | 116 | 2,700 | 215 | 1,610 |
| 1920 | 151 | 1,980 | 347 | 694 | 144 | 2,950 | 135 | 1,990 |
| 1921 | 10 | 1,785 | 96 | 694 | 8 | 2,460 | 8 | 2,000 |
| 1922 | 19 | 1,560 | 33 | 591 | 31 | 2,270 | 35 | 1,810 |

This table, and the more detailed data from which it has been compiled, bring out several points of interest. (1) Prices were not cut during the depression of 1914-15. (2) Price advances began in June, 1915, in two cases and in 1916 in the other two. (3) The rate of advance during the war did not differ widely from the average for all commodities at wholesale. (4) Each of the four machines was marked up in 1920 on the eve of the grand smash. (5) Moderate price reductions were made in 1921, but they had no visible effect in checking the catastrophic drop in demand.

If these figures are typical the machine-tool builders make no serious effort to fight depression by cutting prices. Doubtless they are well-advised in this stand. If the price of a machine tool has been properly adjusted to the savings which its use will enable a buyer to make in his own business, then sales will not often be increased materially by price reductions. Unless a prospective buyer has a market for his own goods, he has no use for a new machine, however cheap. And if he has a market for his own goods, a machine tool is a paying investment at any price which will effect a net saving in his costs. A substantial reduction in the costs of other methods of doing the work which the machine tool takes over may force a cut in the price of the machine. But price cutting has no such effect upon sales in this industry as it has in the market for consumers' goods.

### Technical Interest *vs.* Business Management in the Industry

The upshot of what has been said is that the manufacturer of machine tools has embarked on an extra-hazardous voyage; that he can do little to control the storms which assail him with peculiar violence, and that his best hope lies in joining with his fellows to develop a first-class weather-reporting service for their common safety. All this seems so clear and so simple that there must be some special reason why the industry has not done something of the sort. I think there is such a reason—one based on the character of the industry itself.

Most branches of manufacturing by this time have been thoroughly organized on a money-making basis. They are run by executives who are primarily business men,—men who may know little about materials, processes and products, but who know much about credits, financing and balance sheets. The engineers and designers in these industries take their orders from the business chiefs; they work on problems which are set for them and confine their initiative within the limits drawn by their superiors. The aim of the management is primarily to make money, and industrial operations are systematically subordinated to considerations of business.

To this general rule of the modern world, the American machine-tool industry has been at least a partial exception. Designing and building "the master tools of industry" is such fascinating work that it allures many men by attractions that do not depend on pecuniary returns. On the other hand, this industry has no special fascination for the born business man. Quite the contrary—it is hard to systematize, it cannot be reduced to fine calculations, there is little chance to control the market, the risks are heavy. In fact all the niceties of the trade are on the mechanical side and all the crudities on the business side. So the industry has manned itself with people who are more skilled in mechanics than in business.

The results have been what one would expect. On the

technical side the American machine-tool industry has made a wonderful record. Indeed, in what other industry have we succeeded more brilliantly when judged by standards higher than money making? But on the business side the industry has not been notably prosperous. How long is the list of machine-tool millionaires? And how many times longer is the list of the men who have gone broke in this trade?

So long as the leading personnel of the industry keeps the preponderance of men more interested in mechanics than in business, the situation cannot change much. But the whole trend of economic development is to put business men in the saddle. Even machine-tool building has not wholly resisted this trend and its resistance will be overcome gradually in the future. Every time that a producer gets financially involved, the bankers will see to it that business men control the reorganized concern. Probably the time is coming when the machine-tool trade will be standardized on the money-making pattern, with the engineers and designers all in subordinate positions.

We may not like this prospect. I certainly do not like it. But I know no way of retarding the disagreeable change unless the technical men of the industry will do something which goes against their grain. They must organize to meet the business hazards to which they are exposed in such exceptional degree. By giving some attention to these business problems now, they may at least defer the time when they will be replaced by managers who are mere business men.

# What is Interchangeable Manufacture?

THE definition of interchangeable manufacture is usually given as follows: "Interchangeable manufacture consists of making the parts of a mechanism so uniform in size and contour that each mating part will go together and function properly without fitting. In its highest state of perfection interchangeability is quite exacting, as it demands that each part will function without fitting with its mating part in the same model, no matter when or where it is made.

This process of strictly interchangeable manufacture originated and was practiced by Eli Whitney of cotton gin fame, and spread to European arsenals through the importation of American workmen and machinery. It was known in Europe as the American method. Several attempts at interchangeable manufacture were made in Europe previous to the accomplishment of Whitney, but they failed. It is now believed by those who have studied European methods that the lack of success was due largely to their failure to recognize the fundamental that "the interference of metal must always take place at an undeviating point in relation to the basic standard." Whether or not Whitney realized the full value of this fundamental, his methods disclose the fact that his original model was as near the basic dimensions as the facilities of that day enabled him to make them, and then the parts of this model were considered "maximum metal" and the gages and templets were made to this model, it being retained for checking the wear on the gages. Any deviation from these receiving gages then tended to produce greater looseness of fit and as the model was as near standard as possible, it maintained the point of interference of metal in the same relation to the standard.

### What Unilateral Tolerance Means

This practice of maintaining the point of interference of metal at the basic dimension is now known as the system of unilateral tolerances in contrast to the bilateral system, in which the point of interference of metal is controlled by the amount of tolerance allowed in manufacture. A hole dimensioned 1 in. $^{+\ 0.002}_{\ \ 0.000}$ is the unilateral system. A hole dimensioned 1 in. $\pm$ 0.001 is bilateral. The following discussion of the merits of the two systems is from a paper by the author for the use of Col. Crompton of the English Standardizing Committee.

"Why do we need any system of tolerances? What part do they play in the commerce and manufacture of the world? We need them for many purposes too numerous to discuss in this brief paper, but the most important or primary purpose of tolerances is for interchangeable manufacture. No discussion of any tolerance system should have recognized weight which does not have interchangeability as its ultimate goal.

### Interchangeable Manufacture Reduces Cost

"The greatest economic value of labor is found in quantity production of mating parts by interchangeable manufacture. This system also gives to the consuming public the greatest value for the purchase price and the best service in removal of repair parts.

"As a direct result of interchangeable manufacture the cost of many commodities is brought within the means of the masses, thereby still further increasing the economies to be derived from quantity production.

"It will be noted that the definition of strict interchangeability given does not necessarily mean that the parts must be made without hand work, although that is usually considered desirable. It does mean, however, that when the mating parts are completed, by whatever process, they must assemble and function properly, without fitting individual parts one to the other. On this point hinge some of the controversies on interchangeable manufacture and the advisability of its application.

"It must be realized that the rapid production of a large number of interchangeable parts such as was demanded during the World War necessitates their manufacture in a number of separated shops. For all of these parts to be within the specified limits for size requires that each shop must first have a master gage representing as exactly as possible these limits.

"To produce a number of master gages which shall be identical within very close limits requires Standards that are accurate and identical all over the manufacturing world, or the master gages would have to be made by a single concern which had accurate Standards. If master gages were made by gage makers whose standards were not accurate, there could not be strict interchangeability of the parts made to them. Thus the immense value of the accuracy of the Standard Gages is obvious for the purpose of verifying gages of all kinds."

From address by Col. E. C. Peck, before the Cleveland Engineering Society.

# What Ford Has Done in the Lincoln Plant

By Fred H. Colvin
Editor, *American Machinist*

## How chain, or continuous, assembly is combined with trucks for carrying the chassis forward for various operations—Assembling running boards and testing brackets

IN MANY ways the assembling methods at the Lincoln plant resemble those found in other plants building large, high-grade cars. There are, however, a number of very interesting devices and methods which show the effect of Ford management. The assembly is progressive, and a continuously moving chain is used in some parts of the assembly line. This does not, however, prevent sufficient time and ample care being spent on each assembly operation to secure results that must satisfy the most critical and fastidious.

Before the frame comes to the assembly line, every rivet, whether it holds the cross braces or the running board brackets, has been inspected by tapping with a light hammer to prevent a loose rivet going out in a finished car. In addition, the ends of the frame have been rubbed down and given a finishing coat of paint, which accounts for the different color of the frame end, as shown in Fig. 20. The first operation in building up a chassis is shown on the right, where a frame is supported on the revolving stand, so that the engine mud-pan and other attachments such as gasoline line and fittings, wiring conduits, etc., which are located inside the side-member channels, can be readily put in place. When this is completed, the frame is rolled over and is lifted by a chain hoist, carried to the left and placed in position over a front and a rear axle unit, which have been brought into position in line with the assembling track. The axle assemblies are mounted on testing wheels. While in this position the frame is attached to the springs by means of the shackles, and the frame on wheels is ready to take its place on the assembly track.

### Shackle Bolts Sealed Against Dust

The shackle bolts are worthy of notice on account of their extremely ample size (one inch in diameter), also from the method used to seal them against the entrance of dust or other foreign matter. This latter is accomplished by placing a washer that has a 45-deg. beveled edge on each side of the spring-eye, and so placed as to have the beveled edge outward. Between the washer and the cheek of the shackle is placed a spring ring made from wire of a suitable diameter, which serves as a closure, excluding the entrance of foreign matter. This system is followed on the spring suspension and also throughout the steering mechanism on the front axle.

One of the first units to go into the chassis after it enters the assembly line, is the engine itself, as shown in Fig. 21. Here the springs have been connected and the engine is being lowered into its 3-point bearing in the frame. This view gives a very good idea of the clean-cut appearance of the engine, and also of its outside finish. The cylinders are smooth and are carefully enameled, as can be seen from the reflection on the right side. The appearance of the front gear cover, the fit of the oil pan at the bottom and the smoothness represented by the cylinder head on the block itself, are evidence of the attention that is being paid to pleasing appearance, as well as the quality of workmanship on the essential parts.

### Placing the Radiator and Gas Tank

After the engine and other driving mechanisms have been connected, the radiator and gas tank are put in position and connected and other necessary details looked after, the chassis finally reaches the end of the progressive line and is thoroughly lubricated. It is then sent forward to the testing inspection where it is finally road-tested and such corrections and adjustments made as are necessary to make it ready for final assembly under a body.

The completed chassis is then returned to the assembly department where it is mounted on an assembly-track truck, the test wheels are removed, and it is thoroughly washed, painted and finally swung at right angles to the former progressive-assembly track as shown in Fig. 22. As the paint is not thoroughly hard at this stage, the front crossbar on the frame is protected from being marred by the curved sheet metal guard at *A*, and similar care is taken of other exposed parts. At this point the location of the running-board brackets is carefully tested. The gages shown test the position of the running board brackets with regard to the top of the frame and with each other, so that when the running-board assembly is reached, there will be no fitting with its attendant annoyances and delays, which saves considerable time in assembly.

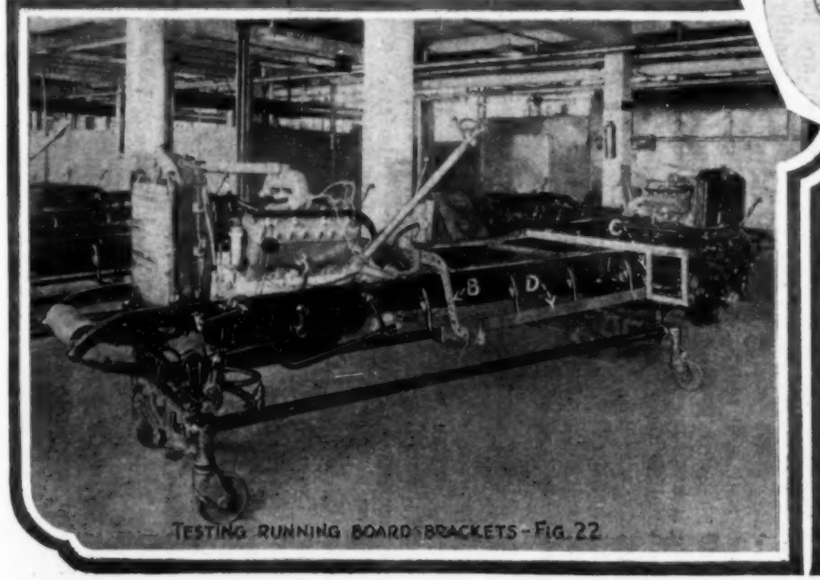
The gage shown at *B* tests the height of the bracket, and also the distance it projects from the frame. The end of the gage carries sliding indicators of the flush-pin type, so that the allowed variations can be readily determined. The gage at *C* shows whether the bracket is level with the two sides of the frame, as can be seen. The spacing of the brackets is determined by the bar *D*, which also shows their alignment.

While the brackets are being lined up, the assemblies composed of running boards and dust aprons are being made as shown in Fig. 23. The bench accommodates two men, one on each side, one preparing right-hand and the other left-hand assemblies. In the center are the various bolts, screws, lock washers, nuts, etc., used in getting the running boards ready for the final assembly. As will be seen, the running boards are of

BEGINNING THE CHASSIS ASSEMBLY - FIG. 20

LOWERING THE ENGINE INTO PLACE - FIG. 21

LINCOLN



TESTING RUNNING BOARD BRACKETS - FIG. 22

ASSEMBLING RUNNING BOARDS AND APRONS - FIG. 23

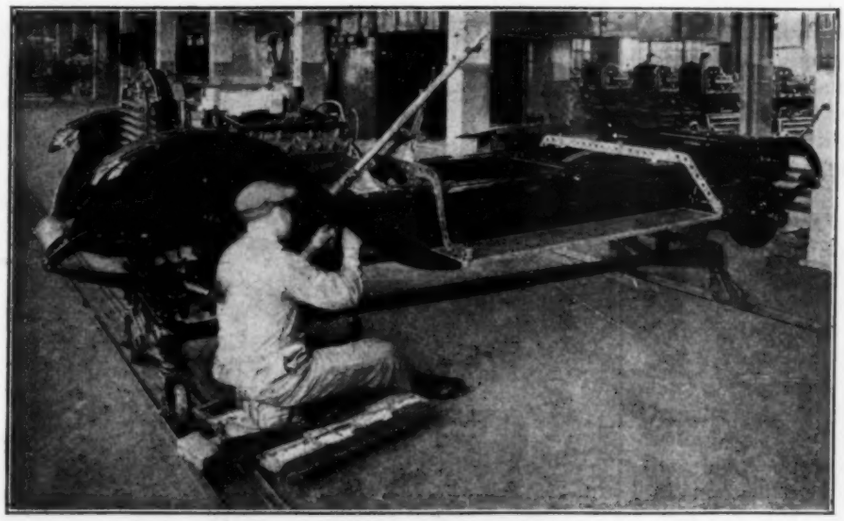


*Fig. 24—Testing running boards in position*

metal construction, having deep webs for strength and rigidity, yet they are of comparatively light weight. The under sides are treated with a coating to resist rust, and electro-zinc plated bolts, screws and washers are used throughout. In addition thick tobin-bronze nuts are used over the lock washers, and effectually prevent bolts and nuts from rusting into a solid mass, as is usual on less carefully built cars. The bolts by which the running board is fastened to the brackets are shown in four rows to match the bracket already referred to. These bolts have square heads and are easily slipped into place and the "button-hole" slots into which they are put are then clinched to retain them while transferring to, and mounting on, chassis.

Wherever sheet metal parts overlap, a strip of substantial webbing is used between the surfaces to prevent any rubbing or annoying squeaks from that source. Some of these strips are shown on the bench in Fig. 23. The nearest apron shows the opening for the storage battery box which is on the right-hand side.

WHEELS OF ASSEMBLY TRUCK GUIDED BY CHANNELS

In Fig. 24, the running board and apron have been placed in position on the frame and brackets, and the front fender is being bolted in position. It will be noted that the wheels of the assembly truck are guided by channels. The truck or "creeper" on which the workman is seated is worthy of special note, as it contains not only a substantial cushion-seat, but compartments which hold the bolts, screws, nuts and lock washers needed in this work. It is also interesting to note the comfortable position possible for the workman while doing what is frequently a very uncomfortable job. Here, too, the fabric strip is used between the adjoining parts.

This view also shows two types of running board gages, the one in front being the same as *B* in Fig. 22. In this case the outer sliding pin is being used to see if the board projects the proper distance. This is essential because the lower ends of both front and rear fenders are attached to the running board, and proper fit is thus assured. The gage at the rear is testing the level of the outer edge of the running board.

After passing down this line, through several bays in the shop where all the sheet metal parts which attach direct to the chassis are applied, and also other work necessary in preparation for mounting the body are made, the chassis goes under the body mounting apparatus where the body is mounted, and the chassis is then headed into another progressive assembly track, where rear fenders, radiator casing, lamps, tire carriers, etc., are added, and the final wheels with tires are put on and brakes adjusted. The finished car finally rolls off the track ready for the final assembly inspection, actual road-test driving, final adjustments and assembling of engine hood and then goes to the loading dock. At the loading dock, the car is thoroughly washed and tested for possible water leaks around windshield and windows and then gets a final general inspection before it is loaded into the box-car, where it is again inspected after it is cleated down, and before the cloth covering or shipping hood is applied and before the car door is closed and receives its seal.

Every facility is provided which will enable work to be done accurately, conveniently and rapidly. The lighting of the shop is excellent and the ventilation automatically controlled for different sections of the plant. The shop, incidentally, is six-tenths of a mile long.

As a further indication of the painstaking care given to provide the user with a product which shall be as perfect as possible, it is interesting to note that every accessory which goes on the car is thoroughly tested before being assembled. Each ignition unit, for example, receives a thorough test, and even the jack which goes in the tool kit is tested under load.

Two examples of the testing methods used are shown in Figs. 25 and 26. In the first, the tire pump, which is attached to the transmission case, is being tested on a special stand, where it is made to actually pump into a receiver of the same capacity as a tire. Here the tachometer shows the speed at which the pump is being driven and the gage above, the pressure the pump is required to produce in a given time. At the same time the air hose with the pressure gage inserted, both of which accompany the pump, are also tested.

One of the later additions to the equipment of the Lincoln car is a full set of Houdaille shock absorbers.

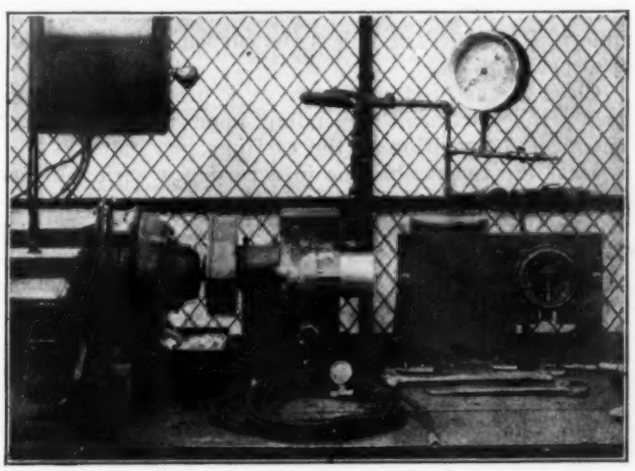


*Fig. 25—Testing tire pumps for efficiency*

This device tends to check the rebound by a hydraulic mechanism which controls the flow of liquid from one chamber to another, and so smooths out the bumps due to a rough road. In order to be sure that the shock absorbers are all properly adjusted before being applied to the chassis, every one is tested on the machine shown in Fig. 26, which was built especially for the purpose.

The shock absorber is mounted as at *A*, and its arm connected by the chain *B* to a 100-lb. weight at *C*. The chain runs over a sprocket behind the handwheel, the wheel being used to return the chain, or to operate the device by hand if desired. An electrical timing device is provided at *D*, so that the time required for the arm to travel its maximum distance can readily be noted. When the arm touches the latch *E*, the electrical connection is broken and the recording mechanism stops. In this way the shock absorbers are tested and adjusted so that they will give just the right amount of resistance to rebound. The lower clamp *F* is for left-hand shock absorbers, the ones at the front and rear operating in opposite directions.

There are many other interesting methods and devices in use, but the ones shown will suffice to set at rest any doubt that may have arisen as to the high quality of product established by the original builders of the Lincoln car, being maintained by the Ford organization.

There is visible evidence everywhere in the plant which indicates that "What Ford Has Done in the Lincoln Plant" is not only to maintain and perpetuate

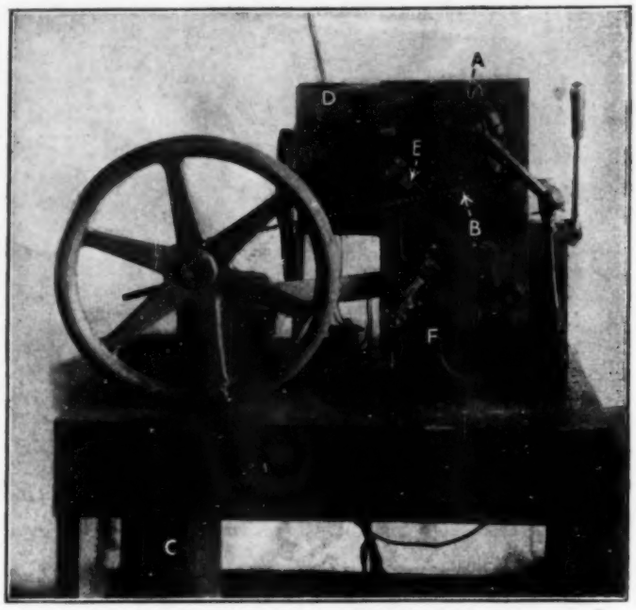



*Fig. 26—Setting shock absorbers for proper rebound control*

Lincoln quality, but to enhance it, and to that end added to new and adequate equipment and improved working conditions, are high ideals, all of which tend to induce individual and personal effort toward the improvement and betterment of the product.

## Steel Casting Specifications

The specifications in this article are from the 1923 Book of Standards of the American Society for Testing Materials and cover steel castings for general service and for ships. When adopted as standard they will supersede the present standard specifications for steel castings as given in the 1921 Book. Two classes of castings are covered; namely, Class A, castings for which no physical requirements are specified, and Class B, castings for which physical requirements are specified. Castings are of three grades: hard, medium and soft.

The steel shall be made by one or more of the following processes: open-hearth, electric furnace, converter, or crucible.

Class A castings need not receive any heat treatment unless so specified, or unless the carbon content exceeds 0.30 per cent.

Class B castings shall receive a proper heat treatment, the treatment depending upon the design and chemical composition of the castings.

Heat treatment shall be in accordance with the tentative recommended practice for heat-treatment of carbon-steel castings, of the American Society for Testing Materials, unless otherwise specified by the purchaser.

The castings shall conform to the following requirements as to chemical composition:

| | | Class A | Class B |
|---|---|---|---|
| Carbon | | not over 0.45 per cent | ..... |
| Phosphorus | Acid | not over 0.07 per cent | not over 0.06 per cent |
| | Basic | not over 0.06 per cent | not over 0.05 per cent |
| Sulphur | | .... | not over 0.06 per cent |

An analysis of each melt of steel shall be made by the manufacturer to determine the percentages of the elements specified. This analysis shall be made from drillings taken at least ¼ in. beneath the surface of a test ingot obtained during the pouring of the melt. The chemical composition thus determined shall be reported to the purchaser or his representative, and shall conform to the requirements specified.

Analyses of Class A castings may be made by the purchaser. The phosphorus content thus determined shall not exceed that specified by more than 20 per cent. Samples for analysis shall be taken not less than ¼ in beneath the surface, and in such a way as not to destroy the castings.

Analyses of Class B castings may be made by the purchaser from a broken tension test specimen. The phosphorus and sulphur content thus determined shall not exceed that specified by more than 20 per cent.

The castings shall conform to the following minimum requirements as to tensile properties:

| | Hard | Medium | Soft |
|---|---|---|---|
| Tensile strength, lb. per sq.in. | 80,000 | 70,000 | 60,000 |
| Yield point, lb. per sq.in. | 0.45 t.s. | 0.45 t.s. | 0.45 t.s. |
| Elongation in 2 in., per cent | 17 | 20 | 24 |
| Reduction of area, per cent | 25 | 30 | 35 |

No maximum limit shall be placed on the tensile strength in any of the grades.

The yield point shall be determined by the drop of the beam of the testing machine.

Bend tests shall not be required for castings of the hard grade and shall be required for castings of the medium and soft grades only when so specified in the order.

When a bend test is specified, the test specimen shall withstand being bent cold without cracking on the outside of the bent portion, around a pin 1 in. in diameter to the following angles:

| | Hard | Medium | Soft |
|---|---|---|---|
| Angle of bend | No bend test | 90 deg. | 120 deg. |

# The Pad System Applied to Journal Bearings

By Major Johnstone-Taylor
Shrewsbury, England

THE pad system, which is now being widely applied to thrust bearings, is also being turned to good account in the construction of large high-speed journals. The efficiency of this design is largely the result of lubrication scientifically applied, in place of insuring the maintenance of an oil film by supplying large volumes of oil under considerable artificial pressure.

The journal bearing of the orthodox type, while in a measure providing means for correct film lubrication, labors under certain important disadvantages which are inherent in its design and which render impossible scientifically perfect lubrication under all conditions. In the case of the ordinary bearing brass, the part must be bored larger than the shaft to give the necessary working clearance; and this clearance, due to points such as expansion, must be considerably greater than the thickness of the working oil film so that, while part of the actual oil film may be approximately correct for load carrying, it is generally only a small proportion of the film that is effective. The greater the clearance, the shorter will be the effective load carrying film.

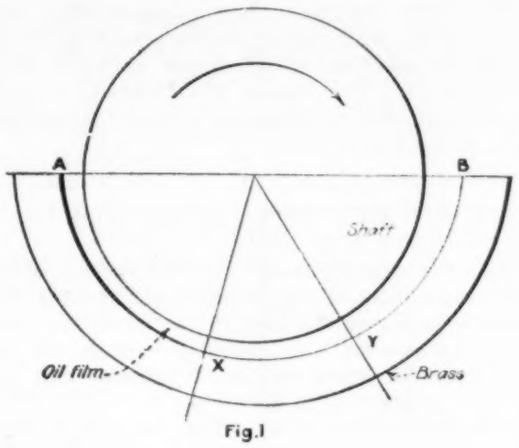


Fig. 1

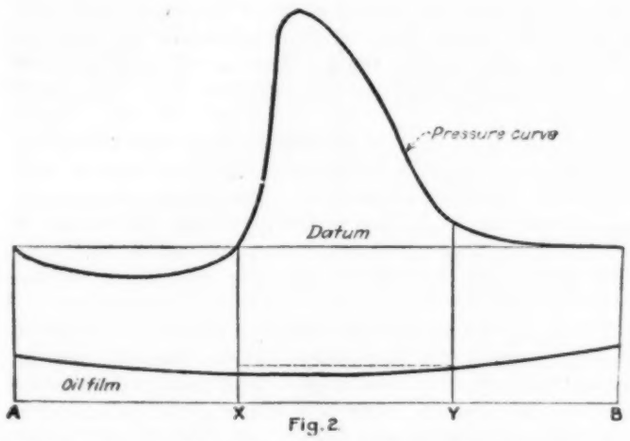


Fig. 2

*Figs. 1 and 2—Oil film of the ordinary journal bearing*

In Fig. 1 a bearing is shown with a very exaggerated clearance, oil being assumed to occupy the space between the shaft and the brass. The direction of rotation being assumed to be clockwise and the weight of the shaft acting downwards, the shaft center naturally moves slightly towards *A* due to the wedging action of the oil, the thinnest part of the oil film occurring at or about *X*. The effective part of the film is that from *X* to *Y*.

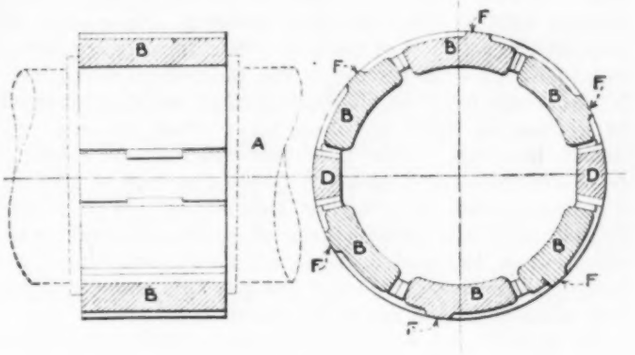



*Fig. 3—Journal bearing equipped with pads*

In Fig. 2 the journal surface is laid out flat and the film shown developed from *A* to *B*. It will be observed that as the two surfaces are of different curvature, when one is laid flat the other is slightly convex. The dotted line shows the condition when the effective portion from *X* to *Y* is formed of two surfaces having the same curvature. The resulting taper of the film in this instance is the same as that obtained with two plane surfaces; namely, the scientifically correct form. This condition cannot be so with the film indicated by the full lines of the figure. Here the film is seen to diverge from *X* to *A*, causing a partial vacuum or negative pressure film, instead of a pressure or load carrying film.

The pressure curve shown crosses the datum line at *X*, and from that point to *A* the negative pressure tends to draw the surfaces together, instead of keeping them apart. The result is a thinning down of the film at *X*, so that for a given speed the bearing will establish metallic contact at a much lower load than one with a perfectly formed film in which there is no suction. Bearings constructed on the pad system cannot suffer from this defect of suction. They are designed so that nearly the whole of the bottom half of the journal

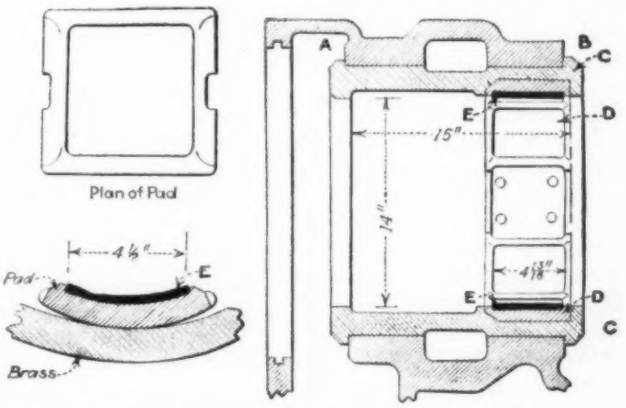



*Fig. 4—Arrangement of pads for a 14-inch bearing*

may be supported upon effective load-carrying films, which take the place of the single ineffective semi-circle of the ordinary journal brass.

The pad arrangement is shown in Fig. 3. Shaft *A* is ground cylindrical and finished smooth. Pivoted pads *B* are ground to exactly the same radius as the shaft and accurately bedded thereon, the pivots *F* resting and rocking against the stationary housing, while stops *D* prevent the rotation of pads *B*. This form of construction insures the formation of the tapered oil film which is the whole basis of the pad system, whether applied to journal bearings or, as is more often the case, to thrust bearings. The fact that the curved rubbing faces are comparatively short in the direction of motion is instrumental in effecting this action. The result is that, with the same degree of safety, journals constructed on the pad system will carry ten times the load of the ordinary journal brass. This consideration is important in the design of heavy bearings.

An example of a large journal equipped with bearing pads in place of brasses is shown in Fig. 4, the diameter of the shaft being 14 in. Originally this bearing was intended to be of the ordinary pattern, and the length would have been some 15 in. from *A* to *B*. At the last moment the design was altered and the brasses *C* bored out to take the ring of pads *D*, the bearing length of which is 4½ in. The saving which can be effected in material, and incidentally in space, is made particularly effective by the case outlined, while the effect of the reduced friction is considerable. In fact, the turbines to which these bearings belong were able to run by their own momentum after steam was shut off for 13½ minutes, the maximum pressure on the bearing area being 550 lb. per square inch.

The drawing makes the construction plain. The housing *A-B* contains brasses *C* bored out to take pads *D*. These pads are lined with white metal at *E* and, as will be observed, can rock in the housing. By reason of this ability to rock they automatically take up such a position with respect to the revolving shaft that a wedge-shaped film of oil forms between the pads and the shaft. This means that lubrication goes on under ideal conditions, enabling a much reduced bearing area to be used.

# It Pays to Keep the Drilling Machines Fit

By Donald A. Hampson

TAKEN all around, there are probably more drilling operations performed than any other. Of this work, a large part is performed on the machines once classed as "sensitive" drills. This classification is a misnomer when applied to the modern upright drill, for the latter bears little resemblance to the 200 lb. machine that was considered the proper tool to use for small holes a decade or two ago.

An examination of drilling machines for holes up to ½ in., in both manufacturing and repair shops, will disclose the fact that more than half of them are in poor repair in the very parts that relate to the sensitiveness that should make for lower drilling costs. The causes of many broken drills, particularly in the hands of low grade labor, are the dropping of the spindle when the drill point has pierced the lower face of the work, and dulled drills or drills with chipped edges.

### Periodical Inspection Desirable

A good plan is to have the foreman or a machinist make a periodic inspection of racks and collar nuts and adjust those that show any play. The quill, or sleeve, is invariably made of cast iron and seems to wear enough to leave slack; then, the collar nuts are always threaded right hand and seem to back away even though they do not separate. A play of even $\frac{1}{64}$ in. at this point will become a source of drill troubles on ½-in. drills, and a proportionate amount applies to other sizes.

There seems to be no better construction for spindle adjustment. The present one is satisfactory and needs but a few minute's attention in a month, but drilling appears to be such a simple process that it does not receive the attention it deserves and a large proportion of machines are "running on a flat tire," to borrow an expression from the automotive field. Go into any shop and watch drilling operations at random and, unless the shop is unusually well kept up physically, the drill may be seen to drop when it passes through the work. This trouble is not as serious on large work because of the more rugged drills used.

Another source of trouble is loose racks. Most machines have a piece of ½-in. square rack about 4 in. long, screwed to a flat on the back of the sleeve by two ¼-in. filister-head screws. No shoulder to take the thrust; no keys. With stock screws in holes tapped in cast iron, it is impossible to keep the racks tight for more than a day's steady running. The play here is generally more than at the collar nuts. The writer has found it best to put in a key, cross-ways of the rack—then the screws may come loose without affecting the vertical movement, but usually the key has the effect of keeping the screws tight, because they are not then subject to thrust.

It is worth while also to shim behind the rack when the teeth are too free fitting through wear of the pinion-shaft holes or otherwise. The counterweight or coil spring on the pinion shaft nominally take care of vertical play, but in practice they do not or, at least, they are not as effective as a proper physical condition of the parts.

There are advantages in having a battery of drills of the same make. If necessary, an idle machine can be robbed to replace a broken part, and fewer spare parts have to be kept on hand. A far sighted policy in a manufacturing shop will keep in stock at least one set of upper and lower bearings and one spindle for each six machines.

An alteration that has proved its worth is the addition of a left-hand feed. Merely pulling down on the feed handle of a drill press is a simple operation—simpler than much of the jig loading that goes with it—and so it is that more production can often be secured by making the jig right handed and the operation of the machine left handed. An extension on the pinion shaft will provide room for the insertion of a feed rod at the left side of the head. Then, because the right hand is more dexterous than the left, the more difficult operation is performed quicker, and, in some cases, it is possible to arrange the work so that the left hand does not have to be taken from the handle at all. The change is well worth considering in connection with fixture design.

# The Mellon Plan and Its Meaning

**By Robert Murray Haig**
Professor, School of Business, Columbia University

## An analysis of certain features of the Treasury Proposals submitted to the Committee on Ways and Means of the House of Representatives on December 17th

SECRETARY Mellon's now famous letter was issued on the 10th of November. At the opening of Congress the President, both in his general message and in his special budget message, gave the Treasury plan a full measure of support. On the 17th of December the Secretary sent to the Committee on Ways and Means a draft of a bill which seems destined to become the Revenue Act of 1924. He accompanied it with a summary of the proposed changes.

Since the first announcement of the Mellon Plan the country has been eagerly awaiting details and specifications regarding the technical changes proposed. The Secretary's letter was full and specific regarding the modifications in the rates but was somewhat vague and indefinite regarding other changes. This was as it should have been. The purpose was to sketch the plan in broad outline and to state clearly the issue of "bonus—vs.—tax reduction." The response to the document is a glowing tribute to the skill and judgment with which it was drawn.

Now, although the proposals have been reduced to the precise language of a bill, the draft is still a confidential document in the archives of the Committee on Ways and Means. However, the Summary which accompanied the bill has been made public and with its aid it is possible to paint in some of the technical detail which was only faintly suggested in the Secretary's November letter.

### Effect on Manufacturers

The supplementary material thus supplied proves to be relatively unimportant. The Secretary laid his cards on the table in November. The outstanding proposals are, of course, the reductions in the rates and the differentiation in favor of earned incomes. These adjustments in the rates invite a revision of the Revenue Act in general and the Treasury seizes the opportunity to stop a few leaks and to make a few other improvements which experience has shown to be desirable. If the Treasury's advice is heeded the structure of the Revenue Act will, however, remain substantially unchanged. Some of the minor changes are of great interest to manufacturers but there appear to be no changes proposed which affect manufacturers as a class, to the exclusion of other classes.

One point which concerns all manufacturers is the effect of the Treasury proposals upon the relative position under the law of the corporate form of organization as compared with the individual and partnership forms. It will be recalled that the Secretary contemplates no change in the present rate of 12½ per cent imposed upon the net income of corporations. The corporation pays this tax year by year as it earns profits and the shareholder pays surtaxes only (not the normal tax) when the profits are distributed as dividends, but only "if and when" they are so distributed. At present the rate of the normal tax, from which the share holder is excused because the corporation has already paid the 12½ per cent tax, is 8 per cent (reduced to 4 per cent for the first increments of income).

> PROBABLY the most important question now before the people of the United States is that put forward by Secretary Mellon in November. Every citizen will be affected in some way by the choice made by Congress between a soldier bonus and tax reduction. Perhaps the most vitally interested class is the manufacturing group. While a bonus would mean a small sum to each of many ex-service men tax reduction spells business revival to manufacturers in certain fields whose plants have been idle or running only part time for months. The provisions of the new tax plan have not yet been made known but its main features may be analyzed from the summary given out to the press.

Secretary Mellon's recommendation is that the normal tax be made 6 and 3 per cent in place of 8 and 4 per cent. It is obvious that this reduces the extent to which the incorporation tax can be taken up as a credit in individual returns and will, to that extent, increase the relative burden of the corporate form of organization.

On the other hand the new proposals regarding a 25 per cent reduction in the taxes on earned incomes promise to operate in precisely the opposite direction, tending to favor the corporate form. Earned income is to be defined as "wages, salaries and professional fees." In the absence of a draft of the bill itself, it is only possible to raise and not answer definitely the questions as to whether proprietors of unincorporated businesses are to be given allowances equivalent to the salaries of corporate officers. If, not, the proprietor of a peanut stand who makes a few hundred dollars of taxable income will be classed as a recipient of unearned income taxable at the high rate, while the $50,000 railroad president will be considered a recipient

of earned income taxable at 25 per cent lower rate. Such an arrangeemnt would tend both to encourage individuals and partnerships to take out articles of incorporation and to stimulate corporations to distribute profits in the form of salaries. This is aside from the serious question of equity which is here involved. England avoids this particular problem of defining earned income to include business profits of individuals and partnerships.

Parenthetically, it seems remarkable, to say the least, that there has been no mention of the desirability of a limitation upon the reduction for earned income. Is a lawyer who receives fees of $100,000 per year to be given a deduction of 25 per cent of his tax, while his non-professional neighbor pays the full rate on his $100,000 in business profits? In England when the differentiation was introduced in 1907 a limit of 2,000 pounds was established beyond which the reduction was not granted. This limit has been somewhat extended since 1907 but it still remains low. Our Treasury proposal, if indeed it proves to be without limitations, is liberal apparently beyond all precedent.

### Stopping the Leaks

In his November letter the Secretary stated that "there should be amendments to strengthen the Act and to eliminate methods heretofore used by taxpayers to avoid imposition of the tax." The new Summary makes clear some of the means he proposes to use in accomplishing this end. Some of the suggestions, however, cannot be understood unless one is familiar with the abuses at which they are aimed. Here is one example. Section 220 of the present law imposes a heavy penalty when corporations are formed to serve as savings banks which pile up profits without distributing them as dividends with the object of avoiding surtaxes. But the penalty is in the form of an added rate on the "net income" of such corporations. However, clever lawyers have discovered that "net income" in the case of corporations is a technical term from which dividends are excluded. Consequently corporations may be formed, and many have been formed, whose only assets are stocks and which may snugly pile up profits in the form of dividends, and still fall entirely outside the penalty of Section 220 because, forsooth, they have no "net income." With these facts in mind it is possible to understand the paragraph of the Summary which reads:

> "13. The penalty under Section 220 which seeks to penalize corporate forms used to avoid imposition of surtaxes on the stock holders is now based on all the income of the corporation which would be taxed in the hands of an individual."

Dividends fall in the class which would be so taxed.

Another attempt to stop a leak is the recommendation that deductions for capital losses be limited to 12½ per cent. The desirability of the suggested limitation is obvious, so long as there is a similar limitation in the rate on capital gains, whatever one may think of the policy of limitations in either direction.

Again corporations have in various ways taken advantage of the very generous provisions in the old law regarding reorganization. For example they have established new high values for depreciation and depletion, thus securing offsets against current income when the written-up values themselves have not been brought to account for tax purposes. They have also been able to distribute values established in this fashion as capital gains (subject to a rate of only 12½ per cent) instead of distributing them as dividends (subject to the large surtax rates). The Treasury bill contains provisions aimed to prevent such practices.

Revokable trusts constitute another favorite device for tax avoidance. The Secretary proposes that hereafter in such cases, the trustee be in effect ignored and that the grantor be taxed on the income of the trust.

Certain states have "community-property" laws which give a wife title to half of the family income. Under the present Revenue Act the husband and wife can file separate returns and thus reduce their surtaxes, a privilege not possessed by residents of states which do not possess "community-property" laws. The Secretary proposes that hereafter in community-property states the income from property acquired after marriage shall be taxed to the spouse having control of the property.

There are also other changes of a character similar to those outlined above which are aimed at specific abuses which the Treasury has found to exist.

Some of the bitterest criticisms of the federal income tax have been directed toward the machinery of the Administration, first, on the ground that it is so highly centralized that a trip to Washington is involved whenever one wishes to discuss a point with the Treasury and, second, on the ground that the only appeal, except to the courts, is to a body which is essentially the same as the body which has made the assessment. Consequently the suggestion that an independent "Board of Tax Appeals" be established to sit locally in the various judicial circuits should be greeted with acclaim. Before this Board the taxpayer and the Treasury representative are to appear as equals and each is to state his case whereas formerly one Treasury representative listened to a complaint regarding the action of another Treasury representative.

### Some Minor Changes That Are Likely To Be Made

Other changes are urged which are designed to make the statutes of limitation consistent, to relieve the taxpayer of the necessity for protesting payment in order to qualify for refunds and to lighten the penalties for minor infractions of the law and regulations. The details of these changes, however, are not yet available.

It is clear that the rate schedule in the bill will be the occasion of a bitter struggle in which the issue is highly uncertain. Whether there will be no bonus and large reductions in rates, or small bonus and moderate reductions in rate or a large bonus and no reduction in rates for years to come are questions which lie on the knees of the political gods. However, there is every reason to believe that practically all of the other proposd changes will meet little or no opposition and that the Revenue Act of 1924 will closely resemble the bill just transmitted to Chairman Green of the Treasury.

## New Codes for Power Plants

Two new codes have been issued by the American Society of Mechanical Engineers, one giving "Rules for the Construction of Low-Pressure Heating Boilers" and the other a "Test Code for Hydraulic Power Plants and their Equipment." These can be obtained from the office of the A.S.M.E., New York, at 80c. per copy and at 65c. in lots of 25 or more.

*The Receiving Department*

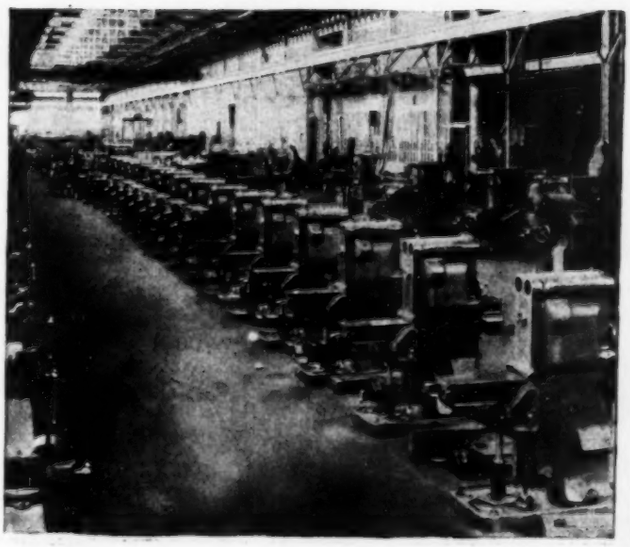
# *Where Machine Tools Are Made*

**Kearney & Trecker Corporation**

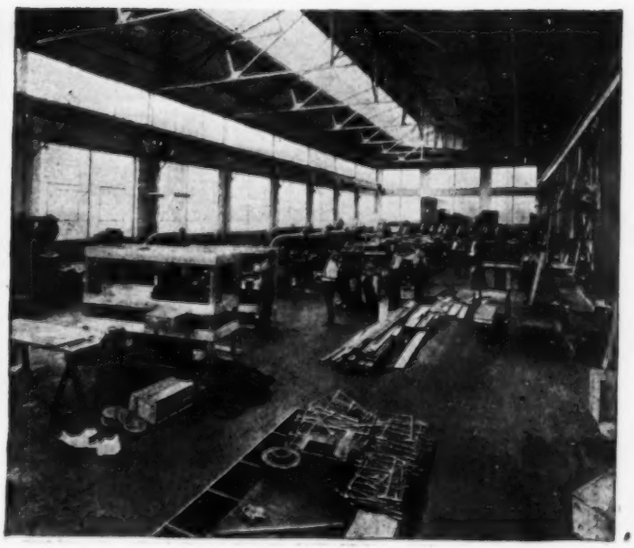
Founded 1898

*The Milling Department*

*Assembly Floor*



*Shipping Department*



# WHERE THE OVERHEAD COMES IN

## An Industrial Movie in Three Reels

*From the Article by*
H. T. Lundquist
*in*
American Machinist Vol. 58 No. 5
*Shop scenes by courtesy of the Garvin Machine Co.*

An order for a repair part comes in

and goes by messenger to the manager

and thence to the order clerk

who makes out an order

which goes to the stock clerk

Order clerk also orders blueprint

A piece of stock is cut off

The tracing is located and

# WHERE THE OVERHEAD COMES IN

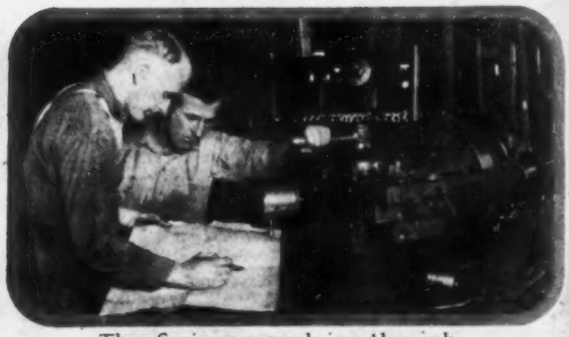
## An Industrial Movie in Three Reels

*From the Article by*
H. T. Lundquist
*in*
American Machinist Vol 58 No 5
*Shop scenes by courtesy of the Garvin Machine Co.*

A blueprint is made from it

Order and print reach the superintendent

The move man gets the stock



The foreman explains the job

The machinist rings the clock

and turns up the piece

The finished piece goes to the shipping room

where it is boxed for shipment

# WHERE THE OVERHEAD COMES IN

## An Industrial Movie in Three Reels

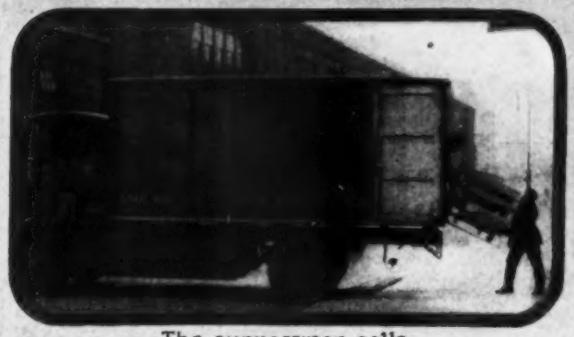
*From the Article by*

H. T. Lundquist

*in*

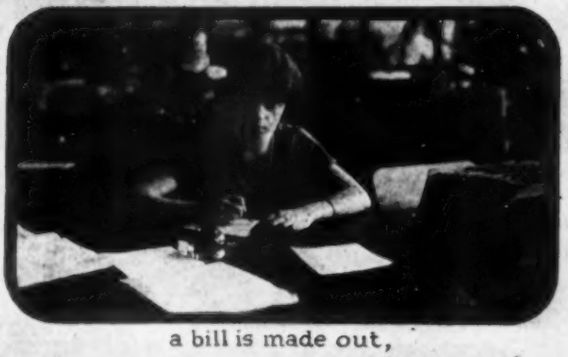
American Machinist Vol 58 №5

*Shop scenes by courtesy of the Garvin Machine Co.*



The expressman calls,

costs are figured,



a bill is made out,

mailed from the mailing room.

"In addition to all this the piece must pay its share of interest on plant and equipment,

the toolroom costs money and

Equipment wears out and there are always taxes

# How the Overhang of Tools Affects Shop Costs

By Charles F. Henry

Examples from modern railway shops that can apply elsewhere as well—Preventing vibration lengthens life of tools—Use largest tools possible and keep them sharp

THE OVERHANG of cutting tools is responsible for more inefficiency in the shop than many realize. Overhang not only prevents maximum speeds and feeds but it also affects the life of the tool and the accuracy of the work. Vibration at the cutting edge causes many breakages and overhang is directly responsible for vibration. In some cases the size of the cutting tool is too small to stand the stress of the work.

Railroad shops furnish many examples of excessive overhang of tools, largely because the work is frequently of such size and shape as to make it impossible to support the tools properly. Then, too, the average shopman, no matter what the kind of shop, has not learned the advantages of using large tools, supported as near the cutting edge as possible. But it is well worth while to study this phase of metal cutting very carefully, as nothing is likely to pay bigger dividends in increased production.

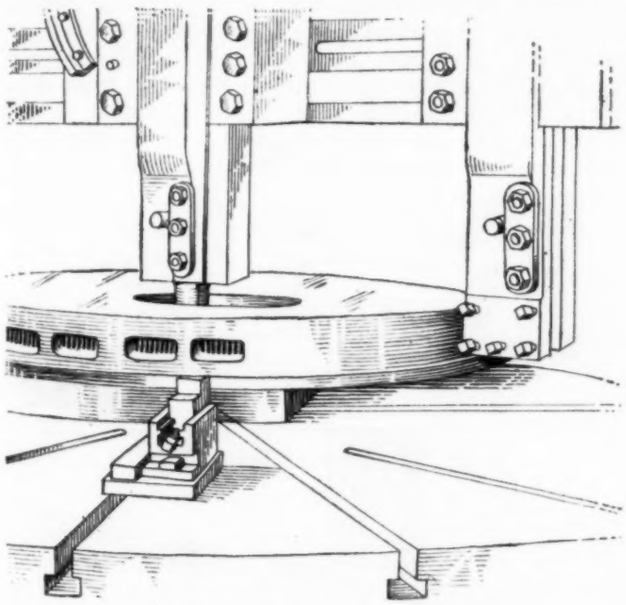


*Fig. 1—Cross rail too high*

As an example of this let me cite a case which recently happened in a large shop. A new planer had been installed and through an error it had been equipped with a motor to drive it at a cutting speed of 65 ft. per min.—considerably too fast for average work. Then came along a hurry job of rather hard steel which had to have one and a half inches removed. Regular tools with the usual settings refused to stand up even with a very light cut and reduced feeds.

We advised using the heaviest tool which could be put in the holder in the clapper box and running the cross-rail down so it just cleared the work. The result was that the job was done with a cut one-half inch deep and a feed of one-sixteenth inch. It is not believed that this speed would be economical in average work of this kind. But it does show what can be done when we use a heavy tool and support it as rigidly as possible.

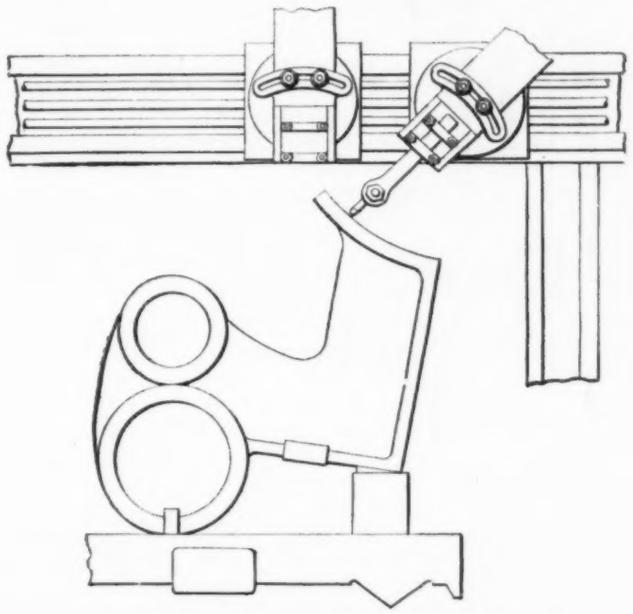


*Fig. 2—Too much overhang on planer tool*

The illustration, Fig. 1, shows a driving wheel being bored and turned with the cross-rail of the machine too high. It should be as close to the work as possible.

Another example is shown in Fig. 2, which is unfortunately typical of many railroad shops, for planing locomotive-cylinder saddles is about as awkward a job as can be found. Here is an excellent opportunity for using the largest tool bar that can be carried in the clapper box, and using the largest cutting tool the bar will carry. The cross-rail should be lowered as far as possible, lengthening the bar which swings the saddle in order to do so. The support of the cutting tool should always be borne in mind. One method of doing

this is shown in Fig. 3. While this plan cannot be used in all cases, it will be a help in some classes of work.

In Fig. 4 is a suggestion for planing a half saddle that can be utilized where the planer rail can be run up high enough to clear the saddle in a vertical position. With the saddle lined up in this manner the arc for the boiler seat can be planed, and at the same time, the side head can be used to face the surface which makes the joint with the other half.

The clapper box should be set at a small angle to get a dragging cut as this gives a smoother finish, gives

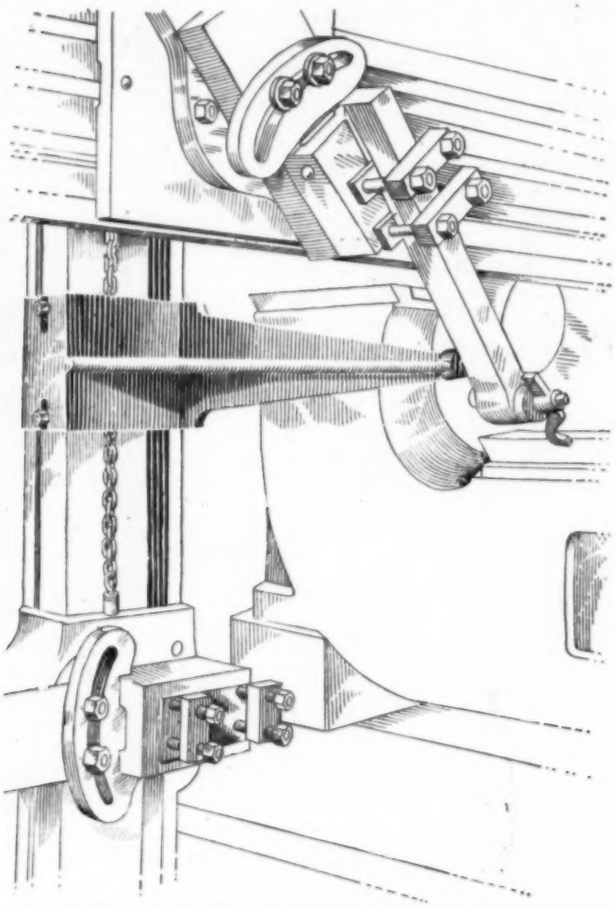


*Fig. 3—Supporting unavoidable overhang*

greater side clearance on the return stroke and on this account increases the life of the tool.

There seem to be many cases where the bad effect of tool overhang is not appreciated, if we judge by the tools in almost any shop. Because a cross-rail is heavy is no reason why it should not be brought down as near to the work as possible. The more rigidly a tool is supported the better for the tool and the work. And this applies to milling cutters as well as to single point tools. The cutter should be as short and as stocky as the work will permit.

The slotting machine is especially prone to have long toolbars in which the spring is considerable. There are times when this is unavoidable, as in the case of slotting frames as shown in Fig. 5. The reason for the long toolbar is to have it available for jobs where four or more frames are slotted at one operation. But it will pay to make a shorter bar to use on the job shown. With the tool held as rigidly as it can be with a short, stocky toolbar, the time for slotting can be materially reduced by the ability to take a heavier cut and faster feed. And these increases will go far to offset the advantages of slotting four at once, when it comes to actual costs. In a similar way the milling

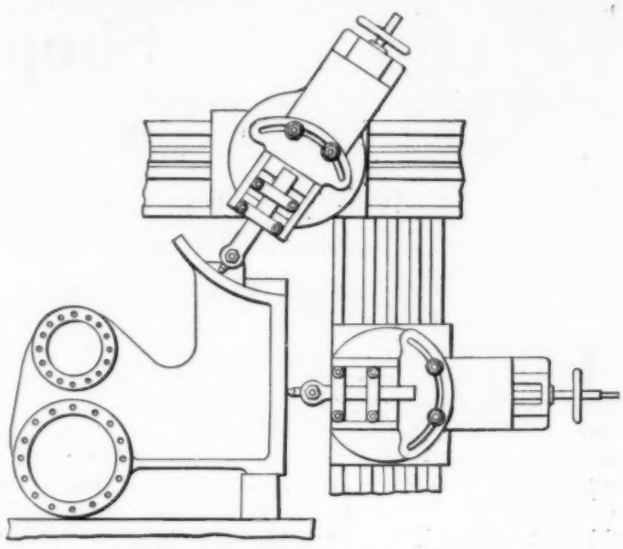


*Fig. 4—Taking two cuts on saddle*

cutter shown in Fig. 6 is too long for milling a single rod most efficiently.

Another case of overhung tools, even though it is not so apparent, is that of the trepanning cutters used for cutting out the ends of connecting rods. The usual practice is to drill a pilot hole of perhaps one inch in diameter and use it to guide the large, hollow cutter, which sometimes runs up to about 14 in. in diameter. Trepanning cutters are usually made with tools long enough to go through 8 or 10 in. of metal, which means that the tools cannot be as well supported as they should, if sufficient chip room is provided. Fig. 7

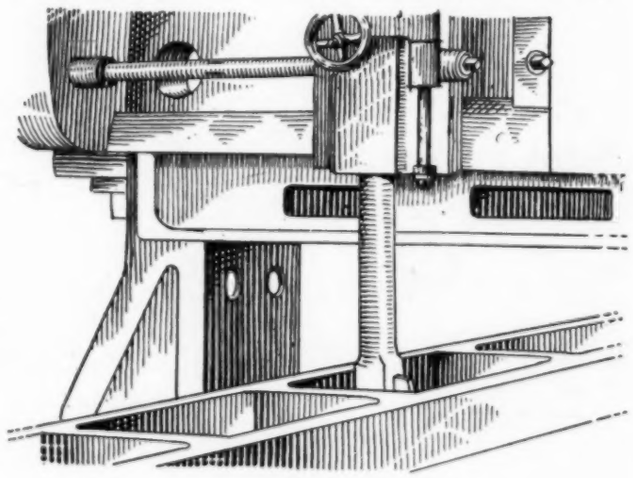


*Fig. 5—Slotter tool too long*

shows this overhang. As a result the time taken is longer than necessary in many instances.

Analyzing a case of this kind, we can take a hole 12 in. in diameter and the rod 5½ in. thick. The cutter in this hole travels about 42 in. or 3.5 ft. per revolution. With a cutting speed of 40 ft. per min. the cutter turns 11 r.p.m. A feed of only 0.010 in. per

revolution at 11 r.p.m. gives 0.11 in. feed per min. and a trifle over 9 min. to cut an inch in depth. For 5½ in. the cutting time would be 50 min.—or call it an hour for easy figuring. The actual time per hole in the case cited above was 2 hr. And probably largely because the overhang of the tool and its lack of support made it impossible to maintain a cutting speed of 40 ft. per minute.

One well-known English firm uses a cutter that caries tools in the end of a pipe of suitable diameter.

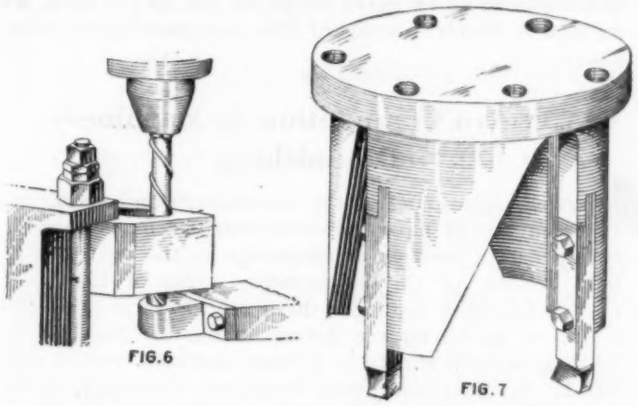



*Fig. 6—Too long milling cutter. Fig. 7—Trepanning cutters without proper support*

The first cutter, set a little in advance of the others, cuts a sort of half round groove in the center. The next cuts a half width groove on the outside, this being followed by a similar cutter on the inside. Then come cutters of nearly full width, followed by the finishing cutter. Dividing up the cut in this way seems to secure good results.

In another case where very much larger holes are trepanned, the cutter head is so designed that the tools are adjustable as they get deeper into the work. At the start of the cut the tools are withdrawn so as to present only a very short projection from the face

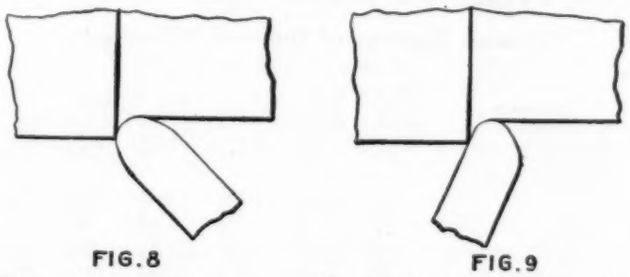



*Fig. 8—Tool set forward. Fig. 9—Dragging cut avoids digging in*

of the cutter head. As the cutters go into the work they are set out from the head as required, but are in a measure, supported by the wall of the cut. These cutters run up to about 40 in. in diameter and present a much more complicated problem than the cutters for connecting rods.

No pilot is used with either of the last cutters described, and perfect results are secured without them. This eliminates both the time for drilling the pilot hole and the wear on the drills. With the comparatively small diameters used in connecting-rod work there is less need of a pilot than with the larger work mentioned. But it would pay to use a starting tool with short, stub cutters and shift to the longer toothed cutter when it became necessary. The spindle which is now used for drilling the pilot hole could carry the first, or starting cutter. But in both cases the heads of the machine should be set as close to the work as possible to reduce overhang.

With a little ingenuity in designing, the cutters and their supports could be made adjustable as in the case of the large trepanning job mentioned. If this was done, but one cutter head would be necessary for each size, and the work could probably be done more rapidly than at present.

One other point, which while not exactly a case of overhang, has a bearing on steady cutting, is the way in which lathe or planer tools are set. The usual practice is to set them at such an angle that they will be forced into the cut rather than away from it, as in Fig. 8. By changing this angle as in Fig. 9 any undue pressure forces the tool out of the cut instead of digging it in. The result is smoother work, less vibration and consequently longer life for the tool, and the ability to get more out of a machine, or tool, than when used the other way.

Lathe men will contend that it is necessary to set the tool forward to get close enough to the dog or chuck. And in some cases this is true. But why set the tool pointing forward in all cases, as is generally found? It may even pay to shift the tool when nearing the chuck.

The importance of keeping the tool sharp is also closely connected to the question of overhang. But this is too often interpreted to mean that the speed or feed must be reduced to avoid the necessity of changing the tool during a cut. This "stopping-in-the-cut" bugaboo should be effectually exploded. Unless it is a finishing cut on some important work as a planer table or similar work, the tool can and should be changed whenever necessary. The deciding factor is the *net* cost of doing the work. If the net cost can be reduced by changing tools every five minutes, they should be changed and replaced by sharp ones.

Careful attention to reducing overhang to the minimum, to using the largest tools and toolbars that can be held in the machine, will enable heavy cuts and feeds to be taken at high speeds without undue dulling of the tool. It is vibration which destroys the cutting edge, and vibration is caused by lack of support, due to small sizes for tools and overhanging supports. Reduce overhang and save money.

## Spiral Bevel Gears Which Can Be Hobbed —Discussion

BY M. H. RASCHE

Since sending you my earlier comment on the article "Spiral Bevel Gears Which Can Be Hobbed," and which I find that you published in Vol. 59, page 764, I have found that Professor Clerk Maxwell, the celebrated English physicist, proved in 1849 that this spiral could be generated by rolling a straight line on a circle. Confirmation of this statement may be found in a paper by Maxwell published in the Transactions of the Royal Society of Edinburgh for 1849, page 535, first example. In my earlier discussion I stated that the discovery of the "important kinematical property" of the Archimedean spiral was discovered by Prof. F. N. Willson of Princeton University.

# Use of Double Cutting Machines —Discussion

By Albert Clegg
Keighley, England

IN HIS article upon the above subject, published on page 306, Vol. 59, of the *American Machinist*, George Avery summarily dismisses as impractical the idea of utilizing the return stroke of a planer table to accomplish useful work, and gives as his reason, the fact that planers are generally so designed as to meet the cutting stresses in one direction only.

While his contention must be admitted so far as it applies to machines of standard construction, no legitimate reason appears why a machine could not be designed to meet the needs of the case. Difficulty might be experienced in applying a double-cutting toolholder to an existing machine that would not be met if the planer had been designed primarily to oppose effective resistance to the pressure of the cut in *both* directions.

Many years ago, when J. Hartley Wicksteed delivered his paper upon this subject before the British Institution of Engineers, he made this statement: "In a well built machine there is absolutely no objection from the structural point of view to cutting on both strokes, and if the work is suitable for the purpose it is an unmixed advantage. The tool on the backward stroke cuts just as well as the one on the forward stroke, and a little better. The backward cutting tool does not require to be cranked in order to make it cut correctly; it will cut more sweetly of its own accord, because whatever spring there may be in the torsion of the cross-slide, being of the same amount in each direction, serves to make the tool dig in on its forward stroke and to ease it on the backward cut."

### Points of View Differ

Mr. Avery seems to have missed the main point of the discussion. The question is: does the principle of double cutting as applied to planers present sufficient possibilities in the way of economical production to justify the construction of suitable machines? If so, there need be no apprehension of undue difficulty in the way of practical results.

Even though a machine built along the lines of the orthodox planer might not be successfully applied to the double cutting principle (Messre. Buckton, the machine tool manufacturers of Leeds, England, believe otherwise), a machine having two sets of standards and two toolholders facing each other at the center of the length of bed would cover all the objections raised by Mr. Avery, and would be in principle and output a double cutting machine.

I rather favor this type; mainly because it allows greater latitude in the use of the double cutting method. With the single cross rail machine, if the work in hand does not lend itself to the operation of double cutting, the job must necessarily be done by the ordinary single cut, quick-return method; but with the double machine two entirely separate jobs can be handled, provided the table will accommodate them, by planing one job on each stroke, as if the planer were two machines.

Further, if the work be suitable, both sets of toolholders may be brought into action upon one job, taking cuts alternately from the same or from different surfaces, instead of both tools being restricted to one surface or cut.

When it is remembered that a machine can be built along these lines for about 25 or 30 per cent extra cost, as compared with standard machines, the extra output possible with correspondingly lessened power costs should more than justify the increased outlay.

Since, with such a machine there would be practically none of the wear and tear due to the high return speeds of the ordinary planer, the life of the machine would be extended and the cost of repairs proportionately reduced. If 40 or 50 per cent more output is obtainable from an extra outlay of but 30 per cent, the method is surely worthy of the most careful consideration.

## German Competition in Machinery Diminishing

Articles appearing in the newspapers and magazines in recent years have indicated that German manufacturers held a position of advantage in the world's markets because of the depreciating value of the mark, and in frequent instances these reports have been of a character to discourage American manufacturers from making serious efforts in foreign markets, writes Consul M. K. Moorhead from Stuttgart, Germany, to the industrial machinery division of the Department of Commerce. Information has now come to hand, however, which shows that these reports have been exaggerated, for the trade returns covering recent years indicate that German exports of machinery since the armistice have never equaled the pre-war volume.

During recent months the mark has depreciated to where it is of negligible value. The occupation of the Ruhr by the French, the reparations problems, and other factors have interfered seriously with industry in Germany, with the result that German machinery exports were such that during last summer the volume was only about 10 per cent of the trade in corresponding months of the previous year. The figures in the following table show the change that has come over Germany's export trade in machinery:

**German Exports of Industrial Machinery**

(In quintals of 220 lb.)

| Machinery | First Quarter 1923 | First Quarter 1922 | June 1923 | June 1922 | July 1923 | July 192. |
|---|---|---|---|---|---|---|
| Metal working | 103,771 | 166,931 | 24,897 | 284,925 | 22,364 | 314,754 |
| Woodworking | 35,566 | 35,578 | 7,621 | 74,392 | 14,389 | 84,074 |
| Stone working | 635 | 833 | 142 | 2,346 | 204 | 2,628 |
| Steam and hydraulic presses and hammers | 3,452 | 8,564 | 701 | 15,047 | 799 | 15,837 |
| Brewing | 3,450 | 2,113 | 182 | 4,634 | 828 | 4,985 |
| Distilling | 345 | 241 | 70 | 700 | 89 | 763 |
| Sugar mill | 793 | 9,733 | 124 | 11,624 | 341 | 13,592 |
| Milling | 23,828 | 17,707 | 5,359 | 38,634 | 8,718 | 44,832 |
| Paper making | 13,060 | 16,034 | 1,704 | 21,069 | 1,713 | 22,216 |
| Pump | 19,968 | 14,724 | 2,584 | 30,122 | 5,608 | 33,758 |
| Refrigerating | 7,095 | 7,895 | 963 | 17,663 | 1,895 | 20,683 |
| Lifting | 15,276 | 17,973 | 4,051 | 34,410 | 4,528 | 42,190 |
| Mining | 8,355 | 10,108 | 996 | 17,367 | 2,331 | 19,149 |
| Ventilating | 5,333 | 5,023 | 1,170 | 11,035 | 2,114 | 12,568 |
| Shoe and leather | 15,467 | 15,551 | 2,943 | 32,661 | 4,497 | 35,822 |
| Chalk, clay, and cement | 15,802 | 15,843 | 2,741 | 33,764 | 5,149 | 38,348 |

In this connection it should be remembered that in pre-war years Germany furnished possibly 45 per cent of the machinery entering international trade, and it would appear that American manufacturers of engineering equipment have an unusual opportunity in soliciting the business that would otherwise have passed to German firms at this time. For some little time longer it is to be anticipated that we will receive reports where German manufacturers are offering machinery at absurd prices, but it would also appear that the day is approaching when this competition will disappear.

# Fifty Years of Drilling Machine Specialization

**Special Correspondence**

Some Cincinnati drilling machine history of the past half century—Contrast between machines and performances of former years and today—Some of the men responsible

HENRY BICKFORD

THE REMARKABLE strides made in machine tool design and practice during the last half century are brought to mind by the fiftieth anniversary of the Cincinnati Bickford Tool Co., Oakley, Cincinnati. Not many companies have stuck to one product for fifty years, particularly those in the machine tool field.

Most of the few whose history extends over half a century have dabbled in many lines and added various machines only to discard them later. Fifty years of endeavor in the drilling machine field with a record of steady growth to a commanding position in the industry certainly afford some excuse for a little boasting on the part of the Cincinnati Bickford Tool Co. Apparently it does pay to strive steadily for one ideal, provided of course, that the effort is combined with good business methods.

In 1874, Henry Bickford opened a small shop at Front and Pike Streets, Cincinnati, which was known until 1887 as the shop of "H. Bickford." His first line consisted of five upright drills ranging in capacity from 20 to 38 inches. As a matter of comparative design it is interesting to note that the 1,000-lb., 20-in. machine had spindle speeds of 73, 137, and 260 r.p.m., while the 3,500-lb., 38-in. type had speeds of 52, 83, 120 and 175. Babbitt-lined bearings were used and one of the talking points was the arrangement that prevented the spindle from dropping when the drill broke through.

Thirteen years later, in 1887, Mr. Bickford sold out to the Bickford Tool Co., organized by Charles Hoefinghoff, president of the Hoefinghoff and Laue Foundry, A. H. Kerkhoff, Bickford's foreman, and G. K. Kerkhoff.

The new company extended the line of machines manufactured by the addition of a 3- and a 4-ft. plain radial and a 4-ft. "universal" radial, in which the head only could be set at an angle. These machines were of the round column type with the driving cone and back gears supported from the base. The spindle of the universal machine was advanced and returned by means of a screw, while those of the plain machines were operated through rack and pinion. The arms were raised and lowered by power, the heads were traversed by screws, and each spindle was provided with three changes of power feed and eight changes of speed. Just what these feeds and speeds were is not now known, but the countershafts for all three machines were fitted with 14x3½-in. tight and loose pulleys and ran at 180 r.p.m. The 3-ft. radial had a 10-in. column and weighed 4,200 lb.; while the 4-ft. machines had 11-in. columns and weighed 5,400 lb. each.

A reorganization of the company took place Feb. 1, 1893, the new name being the Bickford Drill and Tool Co. The officers were Charles Hoefinghoff, president; August Herman Tuechter, general manager; Anton Mill, engineer and superintendent. Mr. Tuechter had been associated with Mr. Hoefinghoff in various capacities since July, 1885, while Mr. Mill, a graduate of the German University of Koenigsberg, had been in this country only a few years. On Feb. 28, 1894, Lewis Glen Keck, of Cincinnati, was admitted as a partner and was made secretary-treasurer of the company.

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**Tables I and II—Developments in 6 Ft. Plain Radials**

Table I

| 1884 | 1894 | 1901 | 1908 | 1914 | 1923 |
|---|---|---|---|---|---|
| 8 | 9½ | 11 | 11 | 15 | 15 |
| 2½ | 3 | 3 | 3 | 3½ | 3½ |
| 10 | 15 | 15 | 15 | 15 | 15 |
| 180 | 200 | 240 | 350 | 425 | 525 |
| 1243½ | 16x3¾ | 16x3¾ | 16x3¾ | 16x4½ | 16x4¾ |
| 1⅛ | 2 7/16 | 2 7/16 | 2 7/16 | 2 7/16 | 2 7/16 |
| 15 | 20 | 19 | 19 | 19 | 19 |
| No. 4 | No. 5 | No. 5 | No. 5 | No. 5 | No. 5 |
| 8 | 8 | 16 | 24 | 24 | 32 |
| 7-247 | 6-110 | 13-211 | 17-233 | 16-270 | 20-544 |
| 3 | 3 | 8 | 8 | 5 | 5 |
| 6-10 | 6-119 | 7-64 | 5-46 | 6-24 | 6-24 |
| 1 17 | 2.18 | 5 99 | 8.73 | 12 36 | 25 |
| 2 54 | 4.36 | 5 99 | 8.73 | 12 36 | 25 |
| 3 800 | 11 000 | 13 200 | 13 800 | 15 500 | 16 000 |

Table II

| General Specifications | 1909 |
|---|---|
| Arm: width of face | 15 in. |
| Belt: width of driving | 5 in. |
| Column: diameter of | 17 in. |
| Countershaft: speed of | 500 revs. |
| Pulley: size of T. & L. | 16x6 in. |
| Spindle: diameter of | 3 in. |
| Spindle: vertical range of | 20 in. |
| Spindle: bored to Morse Taper | No. 6 |
| Speeds: number of | 20 |
| Speeds: range of | 38-519 revs. |
| Feeds: number of | 10 |
| Feeds: range of | 8-40 |
| Horsepower: at minimum speed | 23 4 hp. |
| Horsepower: at maximum speed | 23 4 hp. |
| Weight: net | 19,800 lbs. |

A line of plain radials was designed by Mr. Mill, the "center of circle" capacities of which were 5 ft. 9 in.; 7 ft. 2 in.; 9 ft. and 11 ft. He also designed a 5- and a 5½-ft. half universal radial and a 4½- and a 5½-ft. full universal radial. He equipped the smaller of the plain machines with a swinging or swiveling table, placed back gears on the head, graduated the spindle sleeve for reading depths, and provided an automatic trip for the spindle. On the larger sizes of plain radials he replaced the head-moving screw with a rack and pinion, incorporated an automatic reversing mechanism and added an auxiliary ring to assist in binding the sleeve to the column. His change from the screw-actuated spindle to that of the rack-and-pinion enabled the operator to advance or return the spindle as quickly as in the plain machine. The only other radial being built in Cincinnati at that time was that made by the Universal Radial Drill Co., founded by Messrs. Ahrens, Havekotte, Neiman and Gray, about 1882 or 1883. The arm lengths of their universal radials were 5 and 6 ft., with a "center of circle" capacity of 8 and 10 ft. respectively, while the arm lengths of their plain machines were 4, 5, 6 and 8 ft. The chief individual characteristics of these machines were in the drive and column. The countershaft consisted of "a frame with horizontal shaft, tight and loose pulleys, and a pair of cut miter gears." To allow for the difference in the height of shop ceilings, a shaft 8 ft. long was furnished with this countershaft with a key seat cut the whole length to connect from the countershaft to the driving wheel at the top of the drill column. This, they claimed, would accommodate any ceiling up to 15 ft. in height.

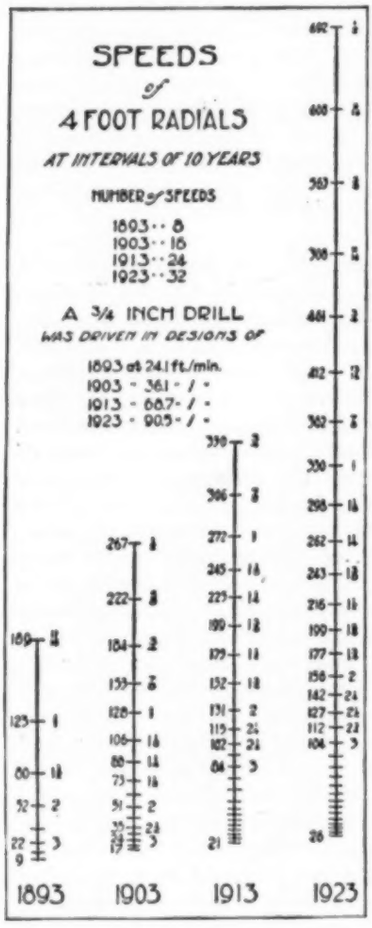



*Fig. 1—Speeds of 4-ft. radials for the past thirty years*

The driving wheel referred to transmitted power to a spur gear keyed to a vertical shaft in front of the column and through this by means of miter gears to a four-step cone carried on a frame mounted on the girdle of the arm and thence to a second cone, equipped with back gears, which drove the arm shaft. The column sleeve extended to the base and was fitted over a stationary stump bolted to the sole plate. Their catalog of that date says: "This stump has sufficient length of bearing to prevent the column from swaying and is provided with an adjustable pivot bearing upon an elastic diaphragm in the column, which, when the bolts in the flange at the lower end of the column are slackened, takes the weight of the machine off the flange bearing and allows the column with arm, etc., to revolve easily the entire circle."

In 1884, this machine of the Universal Radial Drill Co., received the highest award at the 12th Cincinnati Industrial Exposition. In 1886, the business of the concern passed into the hands of P. G. March, now of the Cincinnati Shaper Co., who in 1894 sold it to the Bickford Drill and Tool Company. Mr. Mill remained with the Bickford Drill and Tool Co., until Feb. 9, 1897. On May 17th of the same year Henry McCoy Norris came from Trenton, N. J., to be superintendent and engineer. Charles Hoefinghoff died Nov. 20, 1898, and Mr. Tuechter entered into partnership with Sherman Cornelius Schauer, who for the previous eight years had been superintendent of the Hamilton Machine Tool Co., Hamilton, Ohio. These two men, operating under the name of the Cincinnati Machine Tool Co., specialized on upright drilling machines, while the Bickford Drill and Tool Co., with Harry Conrad Hoefinghoff, president; L. C. Keck, secretary-treasurer and H. M. Norris, superintendent engineer and works manager, concentrated on the manufacture of the radial type.

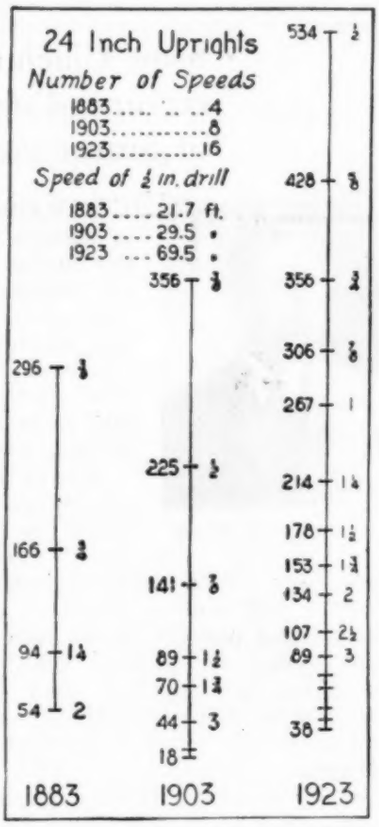



*Fig. 2—Speeds of 24-in. uprights for the past forty years.*

Mr. Schauer made many improvements in the upright machine, among which were his friction back gear, positive geared feed box, geared tapping attachment, and worm wheel elevating mechanism. His company was also the first to bring out the modern type of high-speed, shaft-driven upright. The merit of this design is attested by the fact that it received gold medals at the Pan-American and West Indian Exposition, in 1901-2; the Exposition Universelle, Liege, Belgium, in 1905, and the Exposizione Internationale di Milano, in 1906.

While Mr. Schauer was busy improving the upright, Mr. Norris was equally busy improving the radial type. Among the improvements in the radial incorporated by Mr. Norris were an arm made in pipe section and one that lowered at double its elevating speed and was provided with means to guard against being set in motion by accident; an automatic trip which permitted full spindle travel and at the same time serving as a safety stop; a back gear that gave four changes of speed; a depth gage that read from zero; a geared feed box

that gave eight changes of feed, and a speed box which, with back gears, gave sixteen changes of spindle speeds.

H. C. Hoefinghoff died March 2, 1907 and a few months later , Frederick August Geier, president of the Cincinnati Milling Machine Co., and executor of Mr. Hoefinghoff's will, was elected to the presidency of the Bickford Drill and Tool Co., which he supervised until Feb. 11, 1909, when it was consolidated with the Cincinnati Machine Tool Co., under the name of the Cincinnati Bickford Tool Co. The new officers were A. H. Tuechter, president; S. C. Schauer, vice-president and general manager; George Peter Gradolf, secretary-treasurer and H. M. Norris, mechanical engineer. This concern in 1911 moved into its new plant in the Oakley industrial colony of Cincinnati.

Among the numerous improvements that have been made in the radial drilling machine since the final consolidation are the substitution of bronze for babbitt; the introduction of a narrow guideway for the head, with a greatly increased surface-in-contact between it and the arm; a head-moving mechanism fitted with ball bearings; a back gear lever located so as to be operative from the *bottom* of the head; an arm interlock to prevent its being set in motion while clamped to the column.

The development, in Cincinnati, of the regular type of 6-ft. plain radial drilling machine during the 40 years prior to 1924 is shown in Table I, while Table II gives the corresponding data for a 6-ft. machine introduced by the Bickford Drill and Tool Co., in May 1909. The contrast between it and the tool of 1884 is interesting.

It would naturally be expected that a group of men with the steadiness of purpose of the Cincinnati Bickford concern would have some real achievements to point to with pride. They claim to have been the first to introduce the premium plan of wage payment in the West. It is probably rather generally known that the gate type of gearshift so much used in modern automobiles originated in their shop. Their recognized position in their field is indicated by the fact that in 1902 the Morse Twist Drill Co. ordered from them a special drill-testing machine. It had 36 speeds ranging from 31 to 267, and 24 feeds ranging from 0.00335 to 0.035. Compare these limits with present practice as shown in Figs. 1 and 2. Some idea of the change in practice can be gained by comparing the penetration of ¾-in. drills when driven by the machines of 1883, 1903 and 1923. The respective depths per minute were 0.66 in., 1.27 in. and 11.93 inches.

AUGUST H. TUECHTER, President and General Manager — GEORGE P. GRADOLPH, Vice-President — HENRY McC. NORRIS, Secretary

*Present officers of the Cincinnati Bickford Tool Company*

## Eliminating Lost-Time Accidents in a Steel Plant

A remarkable record of safety accomplishment in a steel plant has been made in the Buffalo plant of the Wickwire-Spencer Steel Corp. Safety work was started in this plant in 1916 and the entire month of October, this year, passed without a single lost-time accident.

The following table shows how the application of a practical safety plan has decreased lost-time accidents:

| | Number Employees | Accidents | Fatalities | Percentage per 100 Employees |
|---|---|---|---|---|
| 1918 | 1,300 | 237 | 5 | 18.23 |
| 1919 | 1,450 | 386 | 2 | 26.95 |
| 1920 | 1,550 | 267 | 2 | 17.22 |
| 1921 | 875 | 96 | 2 | 10.97 |
| 1922 | 1,250 | 127 | 1 | 10.40 |
| 1923 (9 Mos.) | 1,475 | 102 | 1 | 7.73 |

In spite of the fact that in putting certain safety practices into effect it has been necessary to go at the matter somewhat in a rough-shod manner, the work is being done with a feeling of splendid co-operation between the safety department and those in supervisory positions.

In bringing about the results of not a single lost-time accident during October, the following program was used: Adoption of the slogan, "Think First, It Pays To," incorporated on buttons for the men, signs and posters about the shop, pay envelopes, rubber stamp for all outgoing mail and inter-department correspondence, caps for the men, etc.; circular letters every second day to 110 foremen, giving them topics for safety meetings, of which two must be held in each department during the month; bulletins from the office of the director every two days; issuance of books to superintendents and foremen giving the company's safety rules and other safety information; posting of safety information and records on bulletin boards about the shop; and severe criticism for those responsible for accidents.

One important feature of the work was that each bulletin from the director's office dealt with specific situations within the plant and was illustrated by snapshots taken to show bad conditions about the shop and men engaged in doing work in an unsafe way.

# Amortization and the Income Tax

BY L. L. THWING

SOME time ago, prior to the promulgation of the last tax regulations, there appeared in the *American Machinist* one or two articles discussing the possibilities of amortization for reducing the net income for 1918, and the income tax for that year. It is assumed that every machine tool builder has taken advantage of this. If not, a sure method of reducing the tax for 1918 has been neglected, as it can be definitely stated that every machine tool builder in the country is entitled to some amortization. The actual amount depends on circumstances. Since the above articles were published Tax Regulations 62 has appeared, and this provides for amortization on a more liberal basis than was previously permissible.

The earlier regulations provided that any excess of machinery not needed for post war business might be amortized, but it did not provide for the amortization of machinery that is in full use. Regulation 62 covers this condition and allows the amortization of facilities on the basis of excess cost. That is, if a 10x72-in. grinder cost $3,200 in 1918, and it can be replaced for $2,700, a deduction of $500 can be made on this machine. If, on account of shop conditions, the machine is in full use, no amortization can be claimed on that basis, but it can be claimed as above.

It should, therefore, be clearly understood that amortization may be claimed and allowed both on the basis of excessive quantity and excessive cost or, probably, any combination of the two. It often happens that a premium over and above the manufacturer's price was paid for prompt delivery, or that machinery was shipped by truck or express, all of which are clearly items of excess cost due to war conditions and clearly amortizable.

### BASIS FOR AMORTIZATION CLAIMS

If for example, an all steel warehouse was erected in 1918, and it is now found that but half of it is needed, the residual value of this facility would be in the vicinity of 50 per cent of the cost. On this basis alone, if the building cost $10,000, the owner would be entitled to a deduction as amortization of $5,000. On account of the high price of brick, cement, and labor, buildings in which these factors predominate cannot be replaced as cheaply as in 1918, but buildings in which the cost of the steel is a predominant factor can be replaced at a cost less than that for 1918. This is not universally true, but in general it is.

With reference to the above example, when there is no lowered replacement cost there is a residual value of $5,000, which is equivalent to saying that a building of only half the size is now needed. If we assume, however, that the replacement cost is 80 per cent of the original cost, it is apparent that the necessary building can be replaced for 80 per cent of $5,000, or $4,000, which is the residual value of this particular building and indicates a deduction of $6,000, plus one year's depreciation. Practically, this problem might not be worked out in exactly the same way by the Income Tax Unit, but the above example is intended to clearly illustrate the principle involved, which is apparently an equitable one.

The Commission of Internal Revenue has published certain ratios which are to be used in computing the post-war cost of replacement of any facilities on which a lowered replacement cost is claimed, and these ratios must be used. It can be definitely stated, in the case of nearly all machinery of the type found in machine shops, that the replacement cost is less than the war-time cost. The only general exception to this is the case where machinery was ordered in 1916 or the early part of 1917, and paid for on the basis of pre-war prices, but this condition is not common. Buildings of the type generally erected for machine shops cannot be replaced for less than 1918 cost, but buildings like foundries with heavy steel frames, large windows and little brick work will usually show a lower replacement cost.

### AMORTIZATION AN ENGINEERING PROBLEM

The ratios provided by the commissioner are to be used for claims on the above basis, and the determination of the value of excess equipment to its owner is the other basis to be presented. It is evident that both of these are engineering problems. The Income Tax Unit originally attempted to settle amortization problems by accounting methods, but such methods soon were found to be impracticable and the present engineering section was formed. The presentation of a properly supported claim for amortization calls for experience entirely outside of the functions of an auditor. Two and two is always four, but a 28-in. by 20-ft. lathe will not do exactly twice as much work as a 14-in. by 10-ft. lathe. It would be foolish to give an engineer an accounting problem to present to the Income Tax Unit, and the converse is equally true.

The government has recognized that it is an engineering problem but the great majority of accountants have apparently given no consideration to this condition. It is a condition that they have not been able to meet and they have accordingly belittled the possibilities of amortization. It is not believed that this condition is general in the machine tool trade, for the writer is informed that a great majority of claims have been handled by a firm of accountants which has hired an engineer and specialized on amortization claims.

It is therefore suggested that the readers of this magazine who received no amortization, investigate its possibilities, and that those who have had a claim allowed investigate to see if they have had all they need, or all they are entitled to. It is a well recognized principle of shop administration that work should not be inspected by the same man that produces it and this principle might well have a wider application.

## Effect of Severe Cold Rolling of Metals

Some rather striking and unexpected results have been obtained in connection with the Bureau of Standard's study of the effect of severe cold rolling on metals. It has been found that when a metal is deformed by cold rolling it becomes harder, but if the cold deformation is continued without any intermediate annealing, the hardening process continues up to a maximum, after which a reversal occurs and the metal becomes progressively softer. The microstructural changes are also indicative. During the hardening the identity of the crystals can be detected readily, although they are distorted more and more by interior "slipping" within the crystals as the deformation increases.

# Significant Business Indices

FIGURES for December, and in most cases for November, were not available in making the charts below so that movements of the curves during the last two months of 1923 could not be indicated. There will probably be seasonal valleys or peaks in many lines similar to those indicated by the November values shown. For example, employment, imports, car loadings, building, cement production and automobile production dropped during either October or November. When statistics on lumber production are available, that curve also will probably drop. It would seem reasonable to expect that silk, cotton and wool consumption may be favorably affected by the holiday buying.

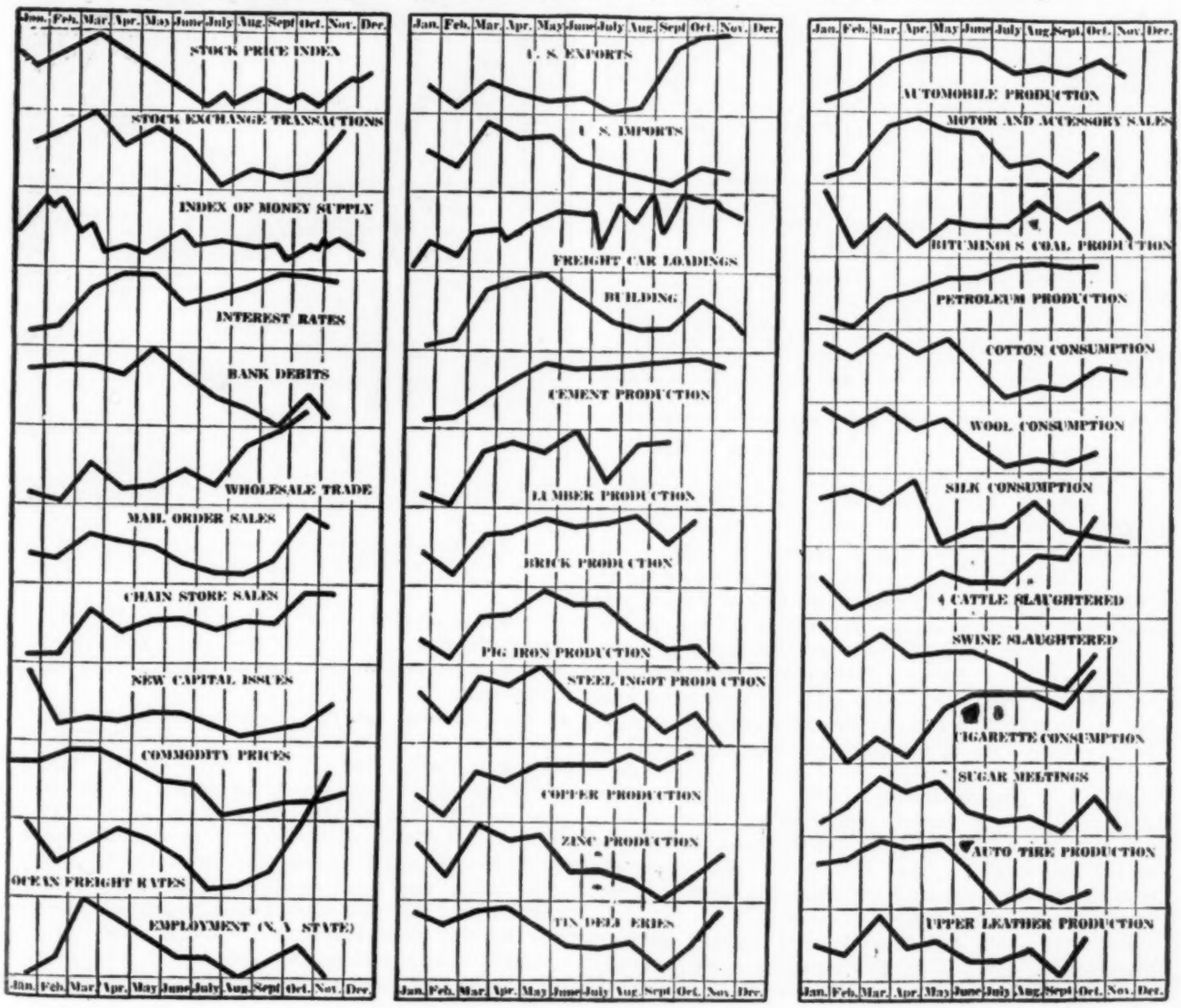
Production of pig iron and steel ingots decreased during the period from the middle of October to the middle of November as was expected. It is interesting to note that copper and zinc production increased and that tin deliveries have had a continual rise from the middle of September to the middle of November.

Pleasing indications are the upward movements of the curves showing stock price index, stock exchange transactions, wholesale trade and U. S. exports.

In connection with the seasonal slump in automobile production the figures for output during the year should be kept in mind. The Department of Commerce reports show that up to the first of December 3,709,320 vehicles were produced, of which 3,361,090 were passenger cars and 348,230 were trucks.

The Department of Commerce, in a report dated Dec. 21, points out further that: "Production of pig iron by merchant furnaces totaled 430,000 tons as compared with 458,000 in October and 386,000 a year ago. Sales for November by merchant furnaces totaled 981,000 tons as compared with 252,000 in the preceding month and 236,000 a year ago. Total bookings of steel castings amounted to 39,660 tons as compared with 37,446 in October and 60,899 a year ago. Prices of iron and steel averaged lower during the month of November."

*Charts by courtesy of the Standard Statistics Co., Inc., 47 West Street, New York City*



# Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for.

## How Some Spherical Bearing Surfaces Were Machined

BY GEORGE C. SMITH
Lewis Institute, Chicago

Occasionally we are called upon to make spherical bearing blocks for use in Tinius Olsen testing machines, the size depending upon the nature of the work our testing laboratory expects to use them for. As will be noticed from the sketch in Fig 1, the blocks are, after hardening, to be ground on the top and bottom surfaces and on both spherical surfaces. It will also be noticed that the radius of the external spherical bearing

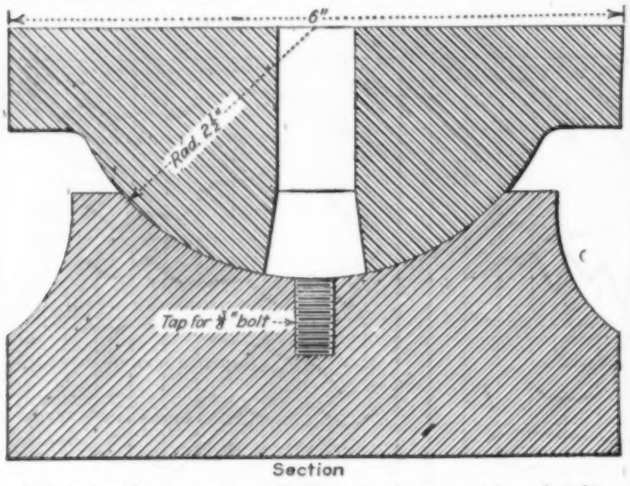



*Fig. 1—Details of spherical bearing block*

must terminate on a point within the plane of the top surface.

Very little preparation was necessary to begin the job. A three-jaw chuck was fitted with a mounting or adapter, which was threaded to fit the spindle of our Cincinnati milling machine. A circular milling attachment was employed, driven in the usual manner through universal joints. A block was machined with a dovetail to fit a lathe cross-slide and compound rest, and it was then bolted to the table of the circular attachment. The arrangement shows quite clearly in Fig. 2.

The three-jaw chuck was screwed on the milling machine spindle and the work was trued up. A round-nose tool was held in the toolpost and the stock was turned on the diameter and faced on the end. The piece was then reversed in the chuck and the same operations performed on the other end.

Before turning out the spherical bearing surfaces the center of the milling attachment was set on center with the milling machine spindle. A set of micrometer rods were next used to adjust the distance from the center of the attachment to the end of the work. After the proper distance had been obtained the centering plug was removed and the cross-slide clamped in position. The tool was then set and adjusted, by means of the compound slide, until the point of the tool just touched the end of the block. The distance from the point of the tool to the center of the attachment was

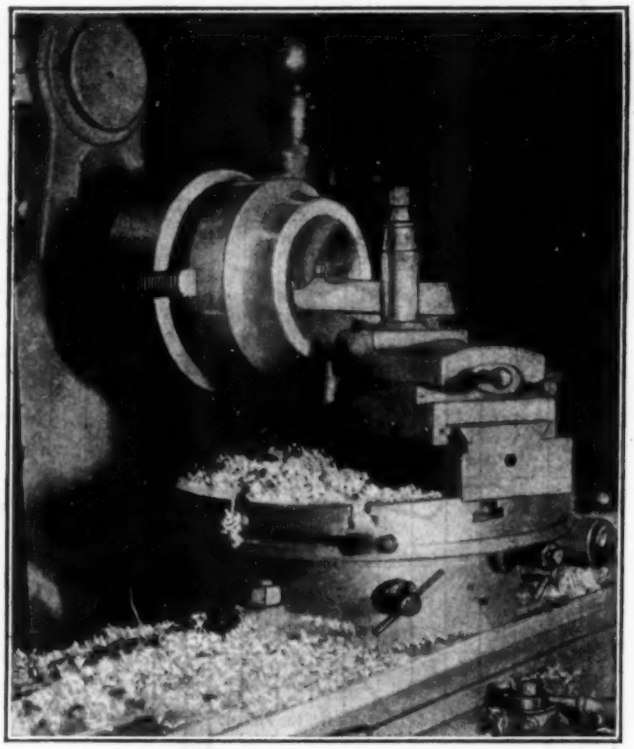


*Fig. 2—Set-up for machining the spherical bearing surfaces*

the radius specified on the drawing in Fig. 1. To adjust the tool for new cuts the saddle and table were moved in without disturbing the radius or the amount of sweep.

After turning out the internal bearing on the bottom block the table setting was changed so that the center of the attachment was inside the arc made by the point of the tool, instead of outside. This setting was used for the external bearing on the top bearing block. The blocks were then hardened, rechucked and ground with a Dumore grinder held in the toolpost. The radius was set from the radius turned with the tool. After the spherical bearing surfaces had been ground they were lapped in on a drill press until the desired bearing and surface finish were obtained. We have used this same method of turning for machining optical grinding plates.

## Spherical Grinding Device

By A. L. Fisher

Devices for spherical turning are to be found in some machine shops, and, as long as their product can be used in the soft state, leave little to be desired. However, if the spheres are to be hardened, it is necessary to finish them by grinding.

The device shown in the accompanying illustrations

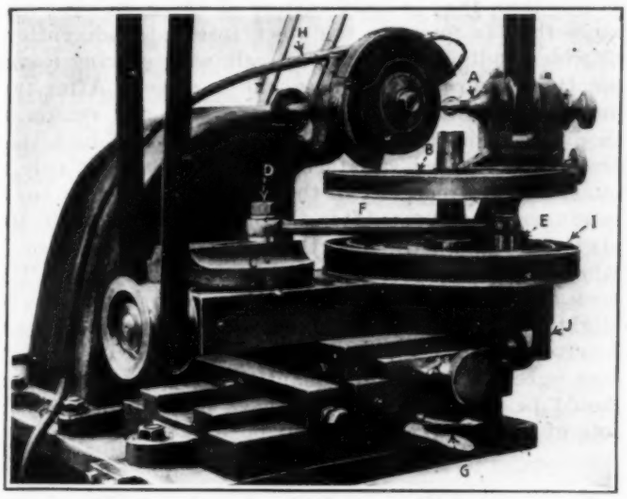



*Fig. 1—Device for grinding spheres*

was designed for grinding spheres—not balls for ball bearings—but such spheres as are integral parts of rods or stems. In so far as possible, like parts in both illustrations are denoted by the same letters.

The sphere is held by its stem in the draw-in chuck *A*, the mounting of which can be moved radially upon the oscillating work-table *B*, to provide means of bringing the sphere to be ground directly over the center of

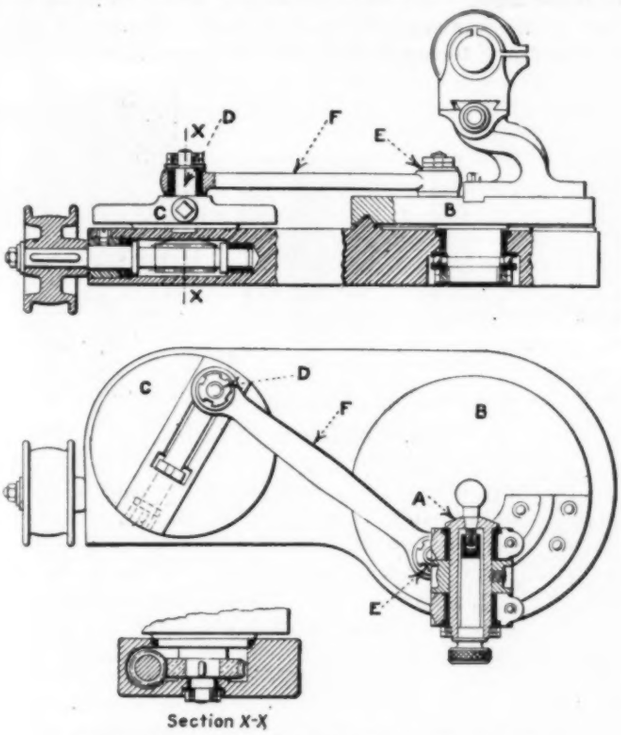



*Fig. 2—Details of spherical grinding device*

oscillation. As will be seen, the device is worm driven, and the disk *C*, which runs continuously, transmits oscillating motion to the work-table through the pins *D* and *E* and the connecting rod *F*. As the position of the pin *D* is adjustable, the amplitude of oscillation of the work-table can be changed to suit the work.

All the moving parts are mounted upon compound slides, so that both the diameter of the work and its position in relation to the abrasive wheel can be controlled. In addition, the whole system can be moved bodily towards or away from the abrasive wheel by a screw, operated by the crank *G*, thus making provision for sizing the work, and for loading and unloading the chuck without disturbing the adjustment of the compound slides. A suitable stop enables a new piece of work to be brought to the same position occupied by the previous piece, so that sizes can be duplicated, adjustments being made from time to time to compensate for the wear of the wheel.

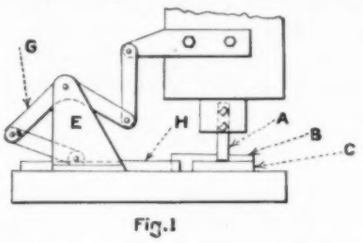
Coolant is supplied to the work and wheel by a pump through the flexible tube *H*, and falls to the retaining pan *I*. What coolant remains on the work-table is confined by a surrounding rim. Overflow from the retaining pan is conducted through the pipe *J* to a convenient receptacle.

## Automatic Stamping

By John Thomas

One of our recent problems was the trade-marking of 100,000 pieces of stock ⅝ in. square by 3 in. long. At first we did the work on a press, feeding the work by hand at the rate of 400 pieces per hr. After a little study, we rigged up the press to handle the pieces automatically and were able to stamp 3,000 pieces per hr. with the press running continuously.

The general arrangement of the device is shown in the accompanying illustrations. Fig. 1 shows the device, excepting the magazine which is shown in Fig. 2. The stamp *A*, Fig. 1, is held in a punch holder in the



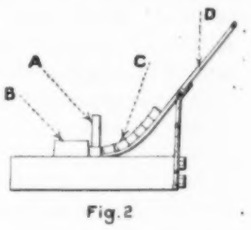




*Fig. 1—Device for automatic feeding of stock*
*Fig. 2—Side view of magazine*

press ram in the usual manner. *B* is a stop block attached to the bolster, and against which the work rests while being stamped. *C* is the work. The magazine *D*, Fig. 2, is made of ⅛-in. sheet steel and has flats riveted along the sides to act as guides for the work. Two brackets *E*, Fig. 1, are attached to the bolster and carry the bell crank *G*, to which is pivoted the push rod *H*. The brackets also act as guides for the push rod.

As the press ram ascends, the action of the bell crank causes the push rod to push out one of the pieces from the magazine and under the stamp. The downward motion of the ram stamps the work and causes the push rod to recede and be ready for the next piece. It will be readily understood that the feeding of the pieces in the magazine is by gravity.

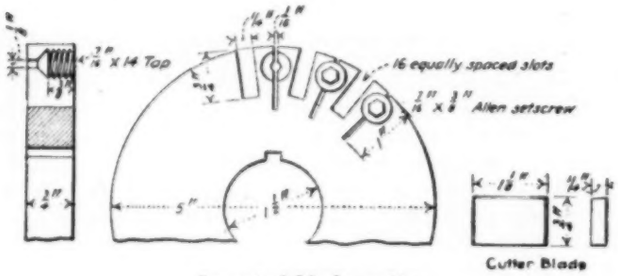
## Inserted-Blade Straddle Mills

By Donald A. Hampson

Straddle mills under 6 in. in diameter are not regularly listed in cutter makers' catalogs, except in the solid type. An almost countless number of straddle mills in the 4- and 5-in. sizes are used for miscellaneous jobs. After a series of grindings, the life of these cutters is over and they must be scrapped. As steel scrap, they have practically no value.

When high-speed steel cutters have been worn, they may be salvaged by specialists in that line and returned to usefulness, if shop conditions permit. If there is a sufficient number of cutters to be salvaged, and the clearances on fixtures allow the use of cutters of smaller diameter, salvaged cutters are a paying proposition. When straddle mills are used singly, slight reduction in diameter is unimportant, and, where there is a large number of cutters on hand, they can be matched and kept in pairs of the same size. The price of carbon steel cutters, however, is so low that it does not pay to re-cut them.

There is felt a distinct need for a straddle mill, or side-milling cutter, in the smaller diameters that does




*Inserted-blade cutter*

not represent so large a proportion of scrap as the solid cutter. Standard inserted blade cutters are all made with a width-to-diameter ratio much greater than is found in the solid type. For instance, a 6-in. cutter will have a width of 2½ in., whereas the solid cutter which it is desired to replace is most frequently used in widths around 1 inch.

In one shop, 4x⅝-in. and 5x¾-in. straddle mills are used in large numbers. These cutters are used in pairs and in gangs, and the fixtures were built in such a way that no increased width could be used—in many cases, the gangs completely filled the arbor length. A most satisfactory design of inserted-blade cutter was worked out and is herewith detailed in the 5-in. size.

The bodies are slotted to receive the high-speed blades. A layout for screw holes is made and the holes put in between every other slot. Lead holes are put in first and afterwards enlarged by the tap drill which is ground to serve as a countersink and leave a depression in the bottom of the holes of the same angle as the point of the screw that is to fit the hole. After tapping, a deep slot is cut through the center of the holes.

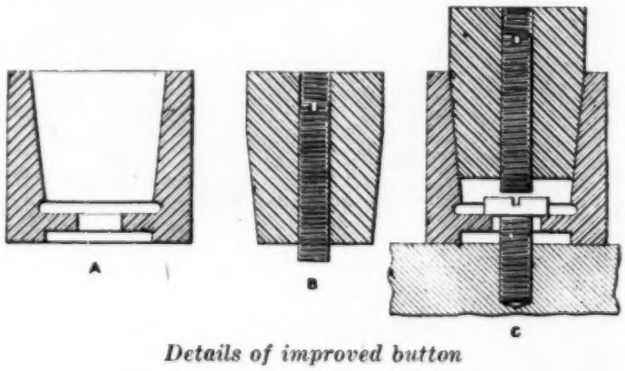
It will be noted that the tapped holes do not extend clear through. The screws used therein are stock Allen setscrews with pointed ends, and when screwed in against the countersinks, they spread the sides in such a manner as to tighten the blades in their slots. The grip thus created is unusually good and the mode of securing it is infinitely superior to the screw-driver screw or a taper pin driven in—no tools other than the customary bent wrench being required.

In the shop referred to the cutters are used exclusively for side milling, not for channeling, and the only clearance put on the outer edges of the blades is a bevel of 10 deg. milled on the bars of stock before cutting up to length. A clearance is milled on the ends of the blades before hardening. Sharpening is quick and easy. The number of teeth in these particular cutters is less than that in solid cutters of the same size, and more than is found in the stock inserted-blade cutters of wider width. The comparatively wide spacing leaves plenty of clearance for the grinding wheel. After two years of use, there has not been found any reason to modify the design. The blades are so well held that they may be used satisfactorily when there is only a quarter of an inch left in the body, which makes for a minimum of scrap. After the blades have become too short to cut on both sides, they are transferred to work where the cutter finishes but one surface at a cut. The cost of making these cutters has been found to be slightly less than the list prices of the next size larger inserted-blade cutters that are cataloged. If the cutters were made in larger quantities, or jigged, the cost would be still less, but they have been turned out in lots of two to six, usually during dull periods.

## Improved Type of Toolmaker's Button

By R. H. Kasper

The general type of toolmaker's button is satisfactory in the general run of work but there are times, when working in close quarters, when it is inconvenient if not impossible to use it. For instance, it may be necessary to bore a hole close to a shoulder. The location may be found by means of spacing blocks or feelers, but the side of the button must remain a certain distance away from the shoulder in order to allow the foot of the indicator to pass through. Again, it may be necessary to locate two holes so close together that




*Details of improved button*

the two buttons cannot be fastened to the work and still permit the indicator to be used. In this case, the one button may be located, the hole bored, and a plug inserted from which measurements are taken for the location of the second hole. Though this method may be satisfactory, the chances of slight error are greater than when both holes may be located at the same time. If a number of holes of different diameters are to be bored, the above method requires that a plug be made for each size hole. In addition, the disadvantage of not being able to locate all the buttons while the work is

on the bench is readily apparent. Besides, the chances of cumulative error are greater, as it is impossible to make a final checking of the work before any of the holes are drilled.

An improved type of button, which is designed to overcome these difficulties is shown in the drawings herewith. The drawings are sectional views, it being understood that the button is cylindrical in form. The part *A* is made in the same manner as the conventional button, with the exception that it is taper bored to receive the part *B*. A recess at the bottom of the bore provides clearance for grinding after hardening. Part *B* is ground taper for about half of its length to fit into the part *A*. A screw provides for easy separation of the parts *A* and *B* without danger of moving the part *A* after it has been fastened to the work. Sketch *C* shows the button in position on the work.

When working close to a shoulder, the part *A* is located by whatever method is the most convenient. Should the space between the button and the work be too small to permit the use of the indicator, the part *B* is inserted in part *A*, and, being of a smaller diameter, sufficient clearance is provided for the passage of the indicator foot. The same method is pursued when two holes must be bored close together. When a number of holes are to be bored, measurements between any two holes may be taken by using the part *B* in the same manner. In indicating, part *B* may be used in applying the indicator.

## Utilizing the Hand Milling Machine

By Albert Clegg
Keighley, England

The utility of the hand milling machine, of which the Whitney type is an excellent example, is greatly underestimated by many. I have in mind a war-time job that under ordinary conditions would have been handled upon larger and more expensive milling machines, but which, in view of the circumstances, was taken care of by the hand miller.

The job in question was milling the heads of "track-link pins" used for joining the track elements of tanks. The pin is shown at *A* in the sketch, and was made from a very tough alloy steel, against which stellite seemed to be about the only cutting agent that would stand up for any length of time.

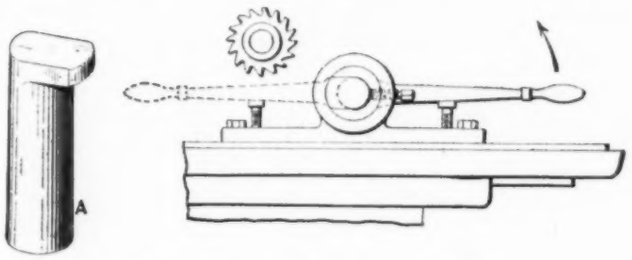
Even with stellite we had the greatest difficulty in making the finish cuts. It seemed to be all right for removing nearly ¼ in. of stock from one side, while merely cleaning up the opposite side, but when it came to taking the finishing cut, the cutting edge would break down very rapidly.

The material was furnished in the form of 1¼-in. round bars, from which pieces long enough to make two pins each were cut. These pieces were center-drilled in a fixture that located the centerholes eccentrically, so that in the following operation of turning practically all of the stock came off from one side. We were finally compelled to resort to the grinding machine for the finishing operation, because we could not get any tools to stand up to the work and produce good surfaces.

After the bodies were ground, leaving an offset unfinished portion in the middle to form the heads, the piece was cut in two. The material was so tough that saws would not stand up and we finally turned to the capstan lathe and ordinary parting tools for the purpose.

The next job was that of forming the head, and the natural first thought was of straddle mills for the flat sides, and formed cutters to finish the round part where it conformed to the diameter of the body. Our experience with the slitting saws made us think twice before bringing expensive cutters in contact with this tough material.

Our reasoning brought us at length to the hand miller with its cheap and easily sharpened Woodruff




*Fixture for hand milling machine*

cutters, and the fixture I have outlined in the sketch. With this machine and fixture we were able to mill the entire form at one setting and with what amounted practically to one continuous movement; the sustained rate of production being about one piece every 2½ minutes.

The fixture consisted of a base clamped to the table of the milling machine, and a boss to form the bearing for a rotatable bushing. To this bushing was attached a handle by means of which it could be rotated through an arc of 180 deg. The rotative movement was limited in each direction by adjustable stop-screws.

The pin was held in place for the milling operation by a setscrew provided with a bronze shoe to avoid marring the work.

The elevating movement of the machine was locked in position with the cutter at the right height to make its passage tangent to the circumference of the pin body. With a pin in place as shown in the sketch and the handle of the bushing held down firmly against the limit stop in its rearward position, the table of the machine would be advanced until the center of the work and the center of the cutter were in vertical alignment, at which time one of the flat sides would have been milled.

The regular table dog was used to limit this forward movement, but instead of bringing up directly against a fixed stop, a loose block was interposed between the latter and the dog. With the table held rigidly in this position by maintaining the pressure upon the hand lever that operated it, the handle of the bushing would now be rotated slowly over to its extreme forward position against the corresponding stop, during which movement the cutter would have travelled around the circular part of the contour of the work. The loose block would now be dropped out and, with the operator still holding the handle of the bushing against its forward stop, the movement of the table would be continued; passing the cutter over the remaining flat and thus completing the operating in one pass.

As the cutters dulled very rapidly, each operator was furnished with a rack holding a number of cutters so that she could replace a dull cutter with a sharp one without delay.

Ordinarily a cutter would run about an hour between sharpenings.

## A Quickly Made Core

By M. E. Duggan

A single core as shown in Fig. 1 was wanted in a hurry, with little likelihood of a duplicate ever being needed. The rounded edges seemed to demand a corebox, and the fact that the widest part was not central with the core lengthwise would mean that it could not be made in halves in a single box and the halves pasted together.

Casey, the molder, said: "Make a frame with two

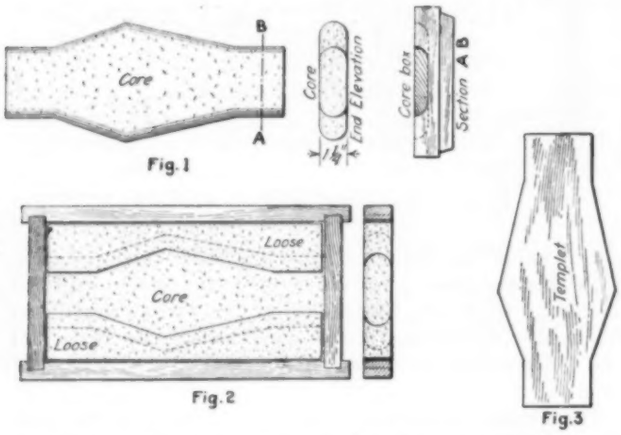



*Fig. 1—The core. Fig. 2—The proposed corebox*
*Fig. 3—The templet*

loose pieces," as shown by Fig. 2, which would involve a lot of time and labor for just one core.

The coremaker said: "You're wrong, Casey. Make me a templet the size and shape the core is to be and I'll just lay it on a 1½-in. slab core, mark round it, and cut to the lines with an old hacksaw blade. Then I will round the edges with a file and have your core finished in half the time you would be tinkering with a corebox." Fig. 3 shows the templet.

## A Right-Angle Drilling Head

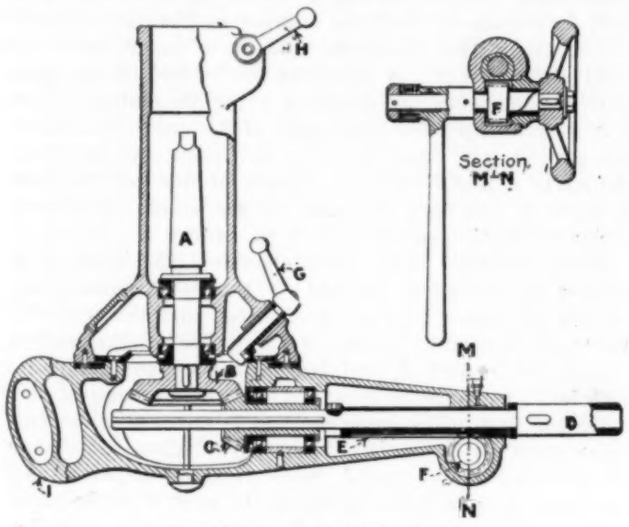
By J. A. Long

The device shown in the accompanying drawing was designed for drilling holes in vertical surfaces of machine parts that were so heavy and bulky as not to be convenient to handle on any regular machine in the shop. It will be readily understood how much easier it is to use the device shown in connection with an ordinary drilling machine, than it would be to locate or clamp a bulky piece in place on a table. This device has proved very efficient when twist drills not much over ½ in. in diameter are used.

The driving shaft *A*, has at one end a Morse taper that fits the spindle of the drilling machine used. At the opposite end is fastened the bevel driving gear *B*. The driving shaft is fitted with two thrust and two radial ball bearings, to reduce friction to the minimum, as well as to secure simplicity of construction and assembly.

The driven gear *C*, together with its keyed bushing, is also mounted on ball bearings, one being a thrust bearing, to take the thrust of the bevel gears. The sleeve of the drill spindle *D*, carries a rack *E*, actuated by the pinion *F*, through which motion for the horizontal feed is imparted by the handle shown in the section M-N. The pinion shaft carries a handwheel at the other end for rapidly moving the drill back and forth. The lever has a ratchet feed for forcing the drill into the work.

The lower part of the device can be swung to any angle and locked in the right position for drilling by




*A right-angle drilling head*

the lever *G*. To facilitate turning the lower portion, the handle *I* is provided.

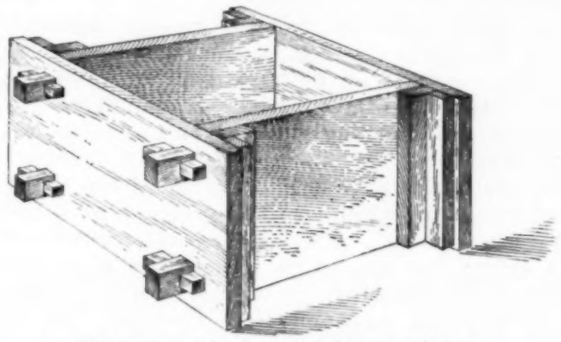
Movement of the lever *H* secures the device to the sleeve of the drilling machine. All rotating members are inclosed in cast-iron oil boxes so that they are completely immersed in oil.

## Joining the Corners of Large Coreboxes

By James McLachlan
Birkenhead, England

There are many methods of joining the sides and ends of large coreboxes, but the one shown in the accompanying sketch, though not so generally used as it should be, has many advantages.

A very common method of making such joints is by means of screws. The objection to screws is that the



*Tongue method of joining coreboxes*

sides and ends of the boxes, especially if presenting large areas, are likely to warp, and in endeavoring to make tight joints the screws will strip the threads from the holes.

Bolts may be used to pull the sides together, but the tongue method, here shown, has much to recommend it.

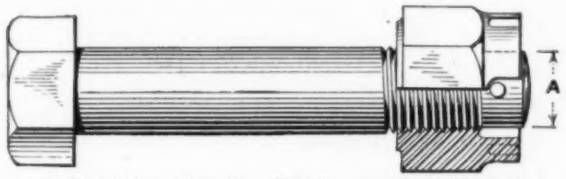
The ends of the box are made of sufficient length to form tongues, which pass through holes in the sides of the box and are fastened by wedges driven through rectangular holes in the tongues. The tongues should be made fairly long, so that the wedges will not cause them to burst.

This method is especially good for deep coreboxes, as they can then be assembled and disassembled without difficulty.

## A Suggested Bolt Design

BY W. BURR BENNETT

One of the annoying problems in the machine shop is that of burring the cotter-pin holes in through bolts having castellated nuts. As the turning and threading of the bolt is a screw machine job, it naturally follows that the drilling of the cotter pin hole is a secondary operation. It is impossible to prevent throwing up a fin or burr where the drill breaks through on the




*Bolt with end reduced below root of thread*

thread. This is usually corrected either by rethreading or countersinking, both of which are time consumers and not always satisfactory, especially the rethreading, which sometimes throws the burr back into the hole, making it hard to enter the cotter pin at assembly.

It seems to the writer that if the end of the bolt were turned down to a diameter just below that of the thread, to a point back of the cotter-pin hole, as at *A* in the sketch, that the entire problem would be simplified. Not only would the end of the thread be afforded some protection, but no burring of the cotter-pin hole would be required. This arrangement would not affect the strength of the thread as it would occur at a point where the nut is castellated and therefore of doubtful holding power on the thread. Incidentally it would make the placing of the nut much easier.

## A Patriarch Among Drill Presses—Discussion

BY GUY HUBBARD

Referring to the article by John Williams under the title given above and published on page 744, Vol. 59, of the *American Machinist*, there is no doubt in my mind that the drill press in question is one designed by Frederick W. Howe and built by Robbins & Lawrence between the years 1853 and 1856. If it is not one of the original Robbins & Lawrence machines, it is almost an exact copy, excepting the gears, which were probably added by some skillful mechanic about the time of the civil war.

Several of the original Robbins & Lawrence drill presses are still running on production work at the plant of Smith & Wesson, Springfield, Mass., and will be fully described in the twelfth of my articles on "Development of Machine Tools in New England," which will appear in a future edition of the *American Machinist*.

## Distant Control for Machine Tools

BY T. W. REVELL
Essex, England

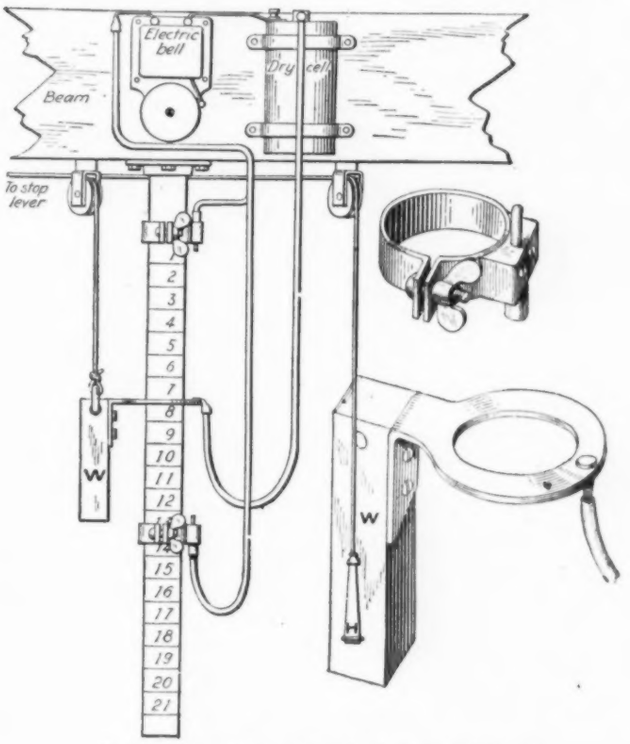
A method of controlling machine tools from a distance is herein described. In the illustration, the gage or telltale is made of ordinary 1½-in. wrought-iron pipe, graduated by a series of rings cut 1 in. from each other and having figures stamped between the rings. If galvanized pipe is used, the rings and figures can be filled with black pigment, making them plainly visible. The pipe is to be attached either to an overhead beam or to the countershaft stringers, by a flange fitting.

The weight *W* is a piece of square bar of any metal to which is attached a ring of sheet metal to form an electrical contact, as shown. A cord from the weight is carried over pulleys to the planer head or lathe carriage, the movement of which causes it to move up or down alongside the pipe, thus indicating the location of the cutting tool with reference to the work.

Adjustable electrical contacts attached to the pipe, a battery and bell are all that are necessary to complete the device.

Connections from the battery are made to the contacts on the pipe and weight, and to the bell. With the contacts properly adjusted, the bell will ring when the tool has nearly reached the end of the cut, thus warning the operator.

If the operator is necessarily giving nearly all his attention to one machine, he can stop the other machine




*Device for distant control of machines*

when the bell rings, by pulling the handle *H* which is attached to a cord connected with the belt shifting mechanism.

This device has saved no end of time and has enabled the operator to run two machines placed some distance apart, each machine, of course, being equipped with the control device.

# American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN
*Editors*

January 3, 1924


## *The American Machinist Begins Its Sixtieth Volume*

WITH this issue the *American Machinist* commences its sixtieth volume. Established in 1877, the paper has forged steadily ahead, a mirror of the progress in the mechanical arts and a leader in the thought of the metal-working industry. During its nearly forty-seven years, the *American Machinist* has not changed its name nor has it absorbed any other papers or combined with any.

The present editorial staff consists of Kenneth H. Condit and Fred H. Colvin, editors; A. L. De Leeuw, consulting editor; L. C. Morrow, managing editor, and S. A. Hand, Ethan Viall, Ellsworth Sheldon, Howard Campbell and F. E. Bardrof, associate editors.

Happy New Year

## *Within-the-plant Simplification*

A GOOD result from engineering and government efforts at simplification has been the introspective attitude acquired by manufacturers. On finding out how many unnecessary styles and sizes are provided in the products they use, they have discovered their own extravagances, and have done some simplifying in their own plants.

The movement has not been confined to things; methods, systems and processes have been revised. There really is more wealth being produced for the effort expended, lower prices result, and greater production follows.

The automobile is still the best example of the benefit from simplification. Motor cars of good quality and low price are plentiful. Their prices are explained by reference to mass production, low overhead and the like. Nevertheless a considerable part of the credit is due to simplification in sizes and kinds of parts and in production processes and systems as well. It may be, after all, that the internal, or within-the-plant savings will prove to be the greatest.

Happy New Year

## *The Wrong Kind of Saving*

WE TALK GLIBLY about savings and thrift but few of us have the same definitions in mind. To some it means walking to save street car fare when the time lost is worth far more than the money saved. Others deny themselves all relaxation and save the money others spend in theaters and similar amusements. And both types call themselves thrifty. But when it comes to the really big things in life, these same people very frequently waste many times what they save in nickels and dimes.

This same habit of alleged thrift leads many shop owners and managers to cling to an old machine long after it has ceased to earn dividends for them. It still runs, to be sure, but it occupies floor space which could produce greater returns and in many cases it has been charged off the books years before.

Clinging to old machines and tools is even worse than refusing to throw away old shoes and hats when they have given us a fair return on the investments. Cutters which can be used a few more days usually lose us money every time they are used. Real thrift does not consist in hoarding small change but in knowing when and how to spend real money for things we can use to advantage.

Knowing when to throw old things away is a gift that makes for real economy.

Happy New Year

## *"Lead Us Not Into Temptation"*

MANY generations of mankind have addressed this plea to their Creator and very few have expected an answer from any other source. It has remained for some officials of our Department of Justice to imagine that they heard the same plea addressed to them by American business men and to do their utmost to answer it.

These gentlemen, in conducting such cases as those against the tile and cement associations, seem to have gone upon the assumption that business men are inherently dishonest and will fall from righteousness if they get a good chance. It being entirely possible to divert statistics of stocks, production and orders for commodities to base uses, the clear duty of an all-wise government official is to prevent the collection of such statistics and save the erring brother from temptation.

The only concession on dissemination of statistical information that seems possible is that the whole job be turned over to the Department of Commerce. If this department could afford to undertake such a job, which would include immediate publication of the figures, a more or less satisfactory solution might result but it is out of the question with the present appropriation.

It may be rank heresy to suggest it but perhaps there is a chance that the Sherman Act could be somewhat improved by amendment to meet the conditions of today.

If one takes the attitude of the Department of Justice in conjunction with what Dr. Mitchell has to say of the needs of machine-tool builders in the leading article this week, the situation is not as pleasant as it might be.

In an article to be published next week details of recent court decisions will be discussed.

Happy New Year

# Shop Equipment News

## Betts Car Wheel Boring Machine

The labor-saving features of the car wheel boring machine now being marketed by the Betts Machine Works of the Consolidated Machine Tool Corp. of America, Rochester, N. Y., include an automatic chuck and independent power rapid traverse to both boring and facing bars. This arrangement is designed to lessen the amount of time and manual labor required for boring and facing car wheels.

The boring bar is rectangular in section and slides in long guides machined in the frame. The facing bar is also guided in the frame of the machine and is located at the rear of the chuck. It has a bearing in a square guide on the under side of the frame, which supports the facing tool close to the cutting point. The facing tool slide is also provided with sufficient vertical adjustment to accommodate the various heights of wheel hubs.

The power rapid traverse is independent to both tool bars so that rapid traverse may be used on one while the other is feeding, if desired. When the wheel is bored, the operator is able to raise the boring bar quickly by power, simply throwing the rapid traverse lever in the desired direction.

Each head is provided with six feeds, obtained through selective sliding gears which may be changed while the machine is running. During the boring operation, when the roughing cutter is through the wheel, the operator throws the proper feed lever, obtaining the finishing feed instantly without stopping the table. Two-in-one boring tools can be used to advantage.

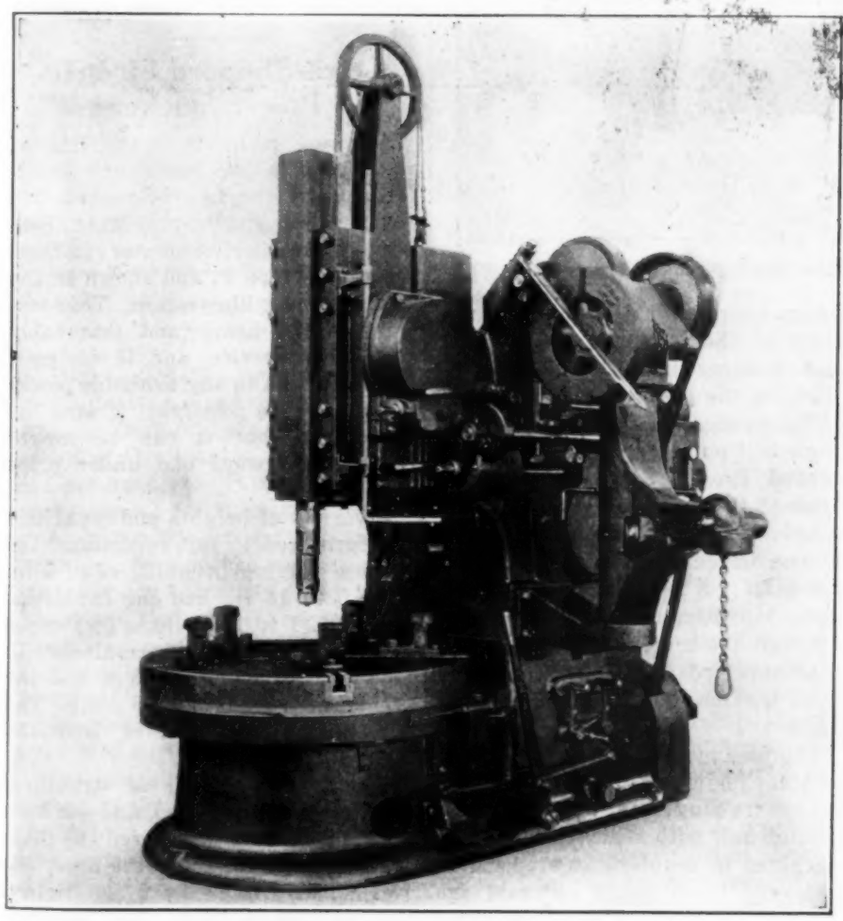
A counterweight is attached to the boring bar so that it can be raised and lowered by means of a hand-operated crank, if desired, for making close adjustment. When the bar is elevated, the counterweight enters a chamber in the frame where it is out of the way.

The automatic chuck is controlled through a reversing friction clutch so that it is unnecessary to stop or reverse the motor when closing or opening the chuck. When the driving clutch is engaged, the table starts to rotate and the jaws move toward the center, gripping the wheel with the full driving force of the motor. The heavier the cut being taken the tighter will be the grip of the chuck jaws on the work.

When the bore is finished the table is stopped by means of a band brake operated by a treadle. The clutch is then thrown to the reverse position, causing the jaws to open instantly without stopping the motor. The band brake also serves the useful purpose of enabling the operator to stop the table and caliper the bore of the wheel without danger of loosening the grip of the jaws on the work. Four table speeds in geometrical progression are available and are obtained through hardened steel sliding gears, located in the base of the frame where they run in oil.

The mechanical hoist, shown attached to the machine in the accompanying illustration, is driven by a belt from the main drive shaft so that only one motor is required for the machine. A pneumatic hoist can be furnished if desired. All control levers for the machine are located on the right-hand side of the machine within easy reach of the operator.

The machine has sufficient capacity to accommodate wheels from 10 to 42 in. in diameter, the diameter of the table being 52 in. The facing head for finishing hubs is not furnished with the machine unless required.



*Betts Car Wheel Boring Machine*

# Cleveland Three-Speed Automatic Screw Machine

A three-speed spindle head has recently been developed by the Cleveland Automatic Machine Co., Cleveland, Ohio, for its line of automatic screw machines, and a machine is shown in Fig. 1, equipped with this mechanism.

The speeds available for the spindle include two forward and one reverse speed, obtained through clutches. The clutch levers, by which the changes of spindle speed are automatically made, are controlled by cams carried on a drum on the camshaft, as shown in Fig. 2. These levers engage or disengage the proper clutches to bring the various combinations of gearing, required for the desired speed, into action. The gears and bearings are lubricated by a splash system inside the gear box.

The three speeds mentioned are obtained by the use of a single set of change gears, and the total speed range of the machine is increased by changing the gears. Four sets of change gears are furnished with each machine, making available a forward speed range from 137 to 751 r.p.m. together with suitable reverse. It is stated that this range of speeds meets all the requirements of the class of production within the capacity of the machine. The change gears are easily placed in position at the left-hand end of the head housing in an opening provided for the purpose.

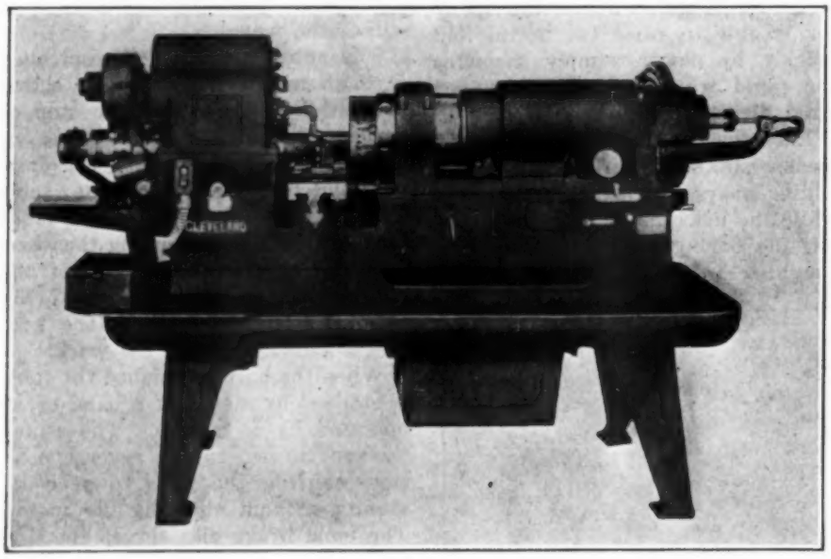


*Fig. 1—Cleveland Three-Speed Automatic Screw Machine*

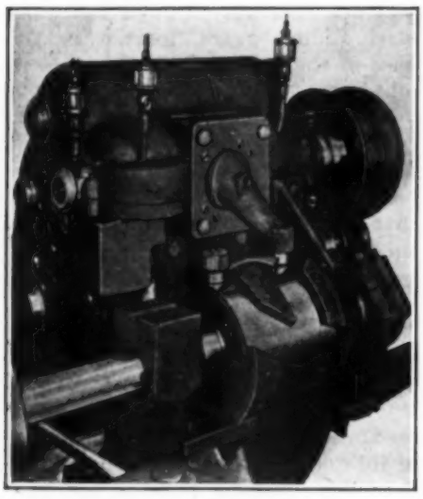


*Fig. 2—Spindle clutch control on Cleveland Machine*

The machine is driven through a single belt pulley, and is started and stopped by a lever located at the right of the pulley and conveniently placed for the operator. The pulley may be driven by a motor, or from a lineshaft. A simple and efficient motor mounting is shown in Fig. 3, although the motor can be mounted in an upper position and arranged to drive the machine through a silent chain.

The feed mechanism is driven at a constant idle motion speed, regulated by the raising or lowering of the friction roll with which this line of machines is regularly equipped. A series of bevel gears connects the driving pulley to a shaft mounted along the bed of the machine and this shaft drives the feed mechanism through a silent chain.

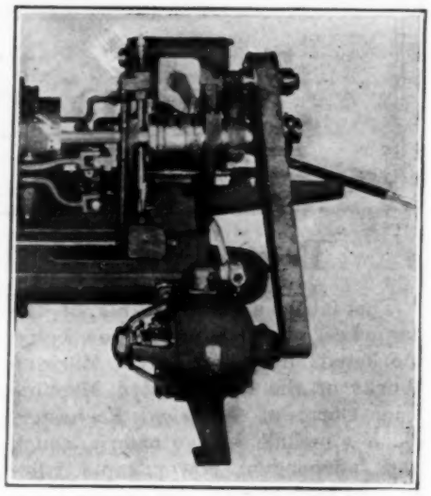


*Fig. 3—Simple and convenient motor mounting*

The arrangement of the spindle head is compact, there is no overhanging mechanism, and all overhead construction is eliminated. The design is intended to provide a self-contained unit for high production, containing all the necessary adjustments for bar stock work within the capacity of the machine.

# Lewis-Shepard Electric Power Stacker

A recent addition to the line of material handling equipment manufactured by the Lewis-Shepard Co., 568 E. First St., Boston, Mass., consists of an electric power stacker, designated type P, and shown in the accompanying illustration. This machine is for heavy and reasonably continuous service, and is designed for connection to any available power circuit. The upright frame is hinged so that it can be moved through doorways and under pipes and beams.

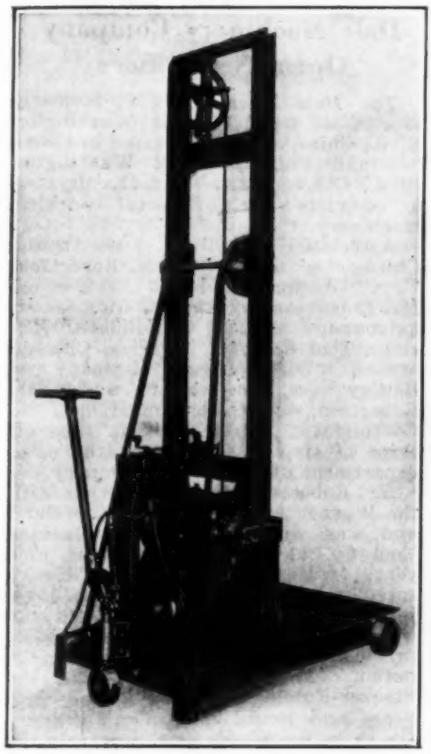
A variety of heights and capacities are furnished to suit conditions, the heights varying in multiples of 6 in. from 6 to 14 ft., and the capacities from 1,000 to 2,000 lb. Two types of carrying platforms are also available, one fitted with rollers and the other constructed of steel plate. The surface of the platform is 24x36 inches.

The frame is made of structural steel, riveted and bolted, and the base is 37x52 in. When lowered the plate platform is 8 in. above the floor, the roller platform being 2 in. higher. The net lift is 24 in. less than the total height of the machine with the

plate platform, and 22 in. less than the total height with the roller type.

The elevator-type motor has a power capacity of 2½ hp., and drives a hardened and ground steel worm through a silent chain. The worm meshes with a bronze wormwheel mounted on the drum shaft, and the worm shaft is carried in ball bearings. The worm gearing is enclosed in an oil-tight housing.

The motor is controlled by a standard hold-over, drum type, reversing controller, which is connected



*Lewis-Shepard Electric Power Stacker*

by linkage to the limit stop and a self-adjusting band brake mounted on the motor shaft. The lifting speed of the 1,000-lb. machine is 40 ft. per min., the 2,000-lb. machine operating at 20 ft. per minute.

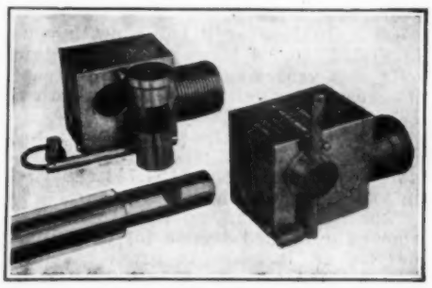
An automatic limit safety stop is arranged to stop the mechanism at both top and bottom of the platform travel, so that it is impossible for the machine to be damaged through the negligence of the operator. Standard equipment includes 50 ft. of heavy insulated flexible conductor connected to the machine.

The hinge in the uprights is furnished at the necessary height from the floor to clear existing obstructions where the stacker is to be used, the minimum possible height being 54 in. The upper section is automatically locked in position.

## Lapointe Machine Tool Co. Broach Holder

An improved holder for attaching broaches to the drawhead of its machines has recently been brought out by the Lapointe Machine Tool Co., Hudson, Mass. Heretofore it has been necessary to make a slot with rounded ends through the shank of each broach, and the shank was held by means of a key passing through both shank and holder.

The improved holder, shown in the illustration with a broach lying before it ready to be set in position, and also disassembled to show the details of its construction, requires no loose parts and needs no manipulation by the operator to engage and release the broach. When the drawhead of the machine reaches its ex-



*Lapointe Machine Tool Co. Broach Holder*

treme outward position, the operator merely pushes the shank into the holder. When the end of the shank touches the cam-shaped roller, the latter is caused to make a partial rotation backward against the tension of the coil spring, thus allowing the broach shank to enter to the shoulder. When the shoulder is reached, the crosswise groove in the shank is directly under the cam-roller, permitting the roller to snap back to its original place under tension of the spring.

The shape of the cam is such that there is no tendency for the roller to rotate in the opposite direction, no matter what the tension upon the broach. To release the hold, however, the operator has but to grasp the broach with one hand, give it a quarter turn in either direction, and the roller will turn back against the spring to the position it occupies when the broach is entering. The broach may then be withdrawn.

The cross-handle in the cam-roller is necessary only as a means of attaching the coil spring, but the broach can be released at any time by pulling the upper end of the handle forward.

This action is utilized to automatically release the broach, an adjustable stud attached to the frame of the machine being arranged to contact with the handle as the drawhead approaches the end of its stroke.

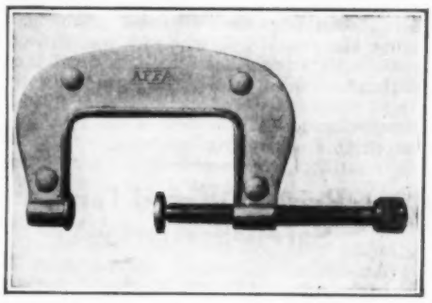
Advantages claimed for this type of holder are that there are no loose parts to become lost; little or no manipulation is needed to operate it; the broach shank is much stronger than with a through key slot; and the crosswise groove is less expensive to produce.

## Affa Pressed Steel C-Clamp

The Affa Specialty Co., 34 Southbridge St., Worcester, Mass., is now marketing the first of a line of pressed steel C-clamps intended for the use of machinists, toolmakers, patternmakers, etc., and for general utility in the workshop and garage.

The frame is a single piece of cold rolled drawing steel blanked to shape, the center cut out, the edges around the opening turned down and the piece folded upon itself in successive press operations. At the same time that the blank is made, holes are pierced so that when the piece is folded over the holes will come into line to receive the rivets, by means of which the sides are joined together into a single beam of T-section. As the piece is folded it is wrapped around an arbor and thus forms the bosses for the anvil and screw.

Because of the simplicity of




*Affa Pressed Steel C-Clamp*

the manufacturing operations these clamps can be produced at a cost much less than that of cast or malleable iron and, because of the scientific distribution of the metal, greater strength with reduced weight is claimed than for corresponding sizes with cast bodies. The size of the clamp shown is 1½ inch. Other sizes up to and including 12 in. are in preparation.

# News of the Week

## Northwest and New England Roads Show Recent Gains

### *Great Northern has outstanding report*

Railroads of the Northwest, which for the most part made a poor showing during the first part of the year, did a remarkable come-back in the month of November, judging from the earning statements made public recently. Among those reporting were the Chicago & North Western, the Chicago, Milwaukee & St. Paul, the Chicago, Burlington & Quincy, and the Great Northern, all of which reported increases as compared with the corresponding month of last year. Of still more significance to the railroad district was that they showed increases over the corresponding month of 1921.

Outstanding was the report of the Great Northern, which showed an increase of approximately 50 per cent over the same month of last year, and a total net income of $4,500,900 for the month, against $3,005,742 in 1922; $3,410,066 in 1921, and $1,892,673 in 1920. These figures bring the net income of the Great Northern for the eleven-month period of the year up to $23,070,405, against $15,811,311 last year.

The Chicago & North Western, which recently cut its dividend rate, also showed for November a net income of $1,608,625, against $1,327,192 in the same month last year.

New England railroads reported increases in some instances. The New York, New Haven & Hartford, for example, reported a net operating income of $1,297,747, against $432,313 in the same month of 1922. This was, however, considerably less than the same week in 1921, when it had a net income of $1,524,730. A large part of the gain over last year was due to the increase in gross revenue, which in November, 1923, was $11,038,299.

The Bangor & Aroostook, with a net income of $234,512, showed a remarkable advance over the $157,744 reported in the same month of last year.

The Long Island, on the other hand, showed a decided decline for the month despite an increase in gross revenue. The net income was $110,428, as compared with $249,342 in November, 1922; $229,146 in November, 1921, and with a deficit of $184,952 during the year 1920.

## Alexander Eiffel Dies in Paris

Alexander Gustave Eiffel, famed constructor of the tower which bears his name, died in Paris, Dec. 28 of cerebral congestion. He was 91 years of age. Eiffel had been retired from public life since the year 1893, when he was drawn into the Panama scandal, but until last Summer, when the first symptons of the cerebral trouble appeared, he worked regularly in his laboratory devoted to engineering subjects.

## Prizes Offered for Safety Scenarios

An industrial safety film contest is being conducted by the National Safety Council in which a prize of $300 is offered for the best scenario received. The contest, which will close at midnight Jan. 31, is open to both members and non-members of the Council. If more than one scenario of outstanding merit is received the Council will make every effort to have it used, under either Council or other auspices and the author will be rewarded accordingly. The judges will be L. A. DeBlois, president, and Marcus A. Dow vice-president, of the National Safety Council, and a representative to be appointed by Will H. Hays, president, Motion Picture Producers and Distributors of America, Inc.

Preference will be given to scenarios which tell a connected story dealing with the Fundamentals of safety. The story, although placed in an industrial setting, should appeal to the individual in any occupation. A disconnected series of accidents will not fill the requirements, because such a series would lack an interesting plot.

## Delay Cut Down at Patent Office

A reduction of 12,035 in the number of patent, design, and trademark cases up for action at the Patent Office has been effected during the past three months, it was learned at the Interior Department recently.

On Sept. 21 there were 74,256 applications for patents on hand and on Dec. 21 there were 65,010 applications unacted upon showing a net gain of 9,241. Applications of designs were reduced from 2,113 on the September date to 887 on Dec. 21, showing a decrease of 1,226. Action was also taken on 1,563 trade-mark applications reducing the number on hand from 3,341 to 1,778.

The Patent Office likewise reported that all applications on patents are being acted upon within nine months at the present time, whereas a year ago a delay existed of 15 months. Applications for designs receive action within 10 weeks now, while a year ago it took eight months. Trade-mark applications are being disposed of in seven weeks. A year ago the Patent Office was so far behind in its work that it took over five months to get final action on trade-mark applications.

## Dale Machinery Company Opens New Offices

The Dale Machinery Co., formerly located at 541-547 West Washington Blvd., Chicago, will be located in rooms 308 and 309, 549 West Washington Blvd., Chicago, after Jan. 1, carrying a complete line of metal working machinery.

Associated with J. J. Dale in the Chicago territory, are C. M. Robertson, F. C. Herman and W. E. Bewley. Mr. Robertson is resigning his position as manager of the Consolidated Machine Tool Corp. of America, Chicago branch. Both Messrs. Herman and Bewley have been working under Mr. Robertson, since the organization of the Consolidated. Prior to that time all three of these men were in the sales department of the Dale Machinery Co.

Mr. Robertson learned his trade with the Warner & Swasey Co. of Cleveland and was with the Colburn Machine Tool Co. as superintendent for nine years; with E. L. Essley in Chicago seven years and in January, 1918, joined the Dale Machinery Co. and was with it as Chicago manager and vice-president until the time of the consolidation. Mr. Herman was with the Stocker-Rumley-Wachs Co. for nine years and joined the Dale Machinery Co. in 1920. W. E. Bewley was in the New York office of Manning, Maxwell & Moore for ten years and joined the Dale Machinery Co. in 1919.

## Calls Conference on Transportation

A call for a national conference on transportation, to be held in Washington, Jan. 9, 10 and 11, was issued today by Julius H. Barnes, president of the Chamber of Commerce of the United States.

Two hundred leaders of recognized standing in agricultural, commercial, educational, financial and industrial fields have been invited to take part in its deliberations and in the discussion of problems involved in the development of an adequate national transportation system.

It is expected that every state will be represented at the conference. The personnel will include spokesmen for national farm and labor organizations, public officials, editors and publishers, heads of large commercial and industrial corporations, bankers and insurance company officials, and executives of railway systems, steamship and motor transport companies.

# Railroads of the Country as a Whole Report Record Breaking Year

## *Have transported greatest traffic in their history*

Unprecedented achievements in meeting without difficulty the transportation needs of the country have been accomplished by the railroads of the United States during the year 1923, according to the annual report of the American Railway Association.

Not only have the rail carriers successfully transported the greatest freight traffic in their history, but they have done so without any transportation difficulties whatever and with virtually no car shortage. They have also at the same time improved the physical condition of their rolling stock to the highest point in years.

With complete reports available for the first forty-nine weeks—that is, from Jan. 1 to Dec. 8, inclusive—and estimates for the last three weeks of the year, loading of revenue freight in 1923 totaled approximately 49,844,000 cars, an increase of fifteen and two-fifths per cent over 1922 and ten and one-half per cent greater than in 1920 when freight traffic was the heaviest on record. Loadings in 1923 also exceeded the war period of 1918 by nearly twelve per cent and 1921 by almost twenty-seven per cent.

### Enormous Loadings

During nine consecutive months this year, loadings have averaged more than a million cars weekly—a remarkable record in itself. The peak loading was reached during the week which ended Sept. 29, when the total was 1,097,274 cars, 78,735 cars or eight per cent in excess of the record established in 1920 when 1,018,539 cars were loaded in one single week, which record stood until this year when it has been surpassed in seventeen separate weeks.

In accordance with the program unanimously adopted at a meeting last April in New York for the purpose of providing adequate transportation in 1923, the Class One railroads have placed in service nearly 200,000 new freight cars and about 4,000 new locomotives. Detailed figures for the full year are not available but from Jan. 1 to Dec. 1, new coal cars installed totaled 75,346; box cars 70,206; referigerators 20,520, and stock cars 4,857. During the same period reports showed 3,704 new locomotives placed in service. New freight cars on order Dec. 1 totaled 36,789 and new locomotives 739, with deliveries being made daily.

### Much Money Spent

Capital expenditures for equipment and other facilities alone actually made in 1923 totaled $1,075,897,940, compared with $429,272,836 actually expended in 1922. In addition there was carried over into 1924 authorizations made this year for similar capital expenditures amounting to $300,806,519. This makes a total of $1,805,977,295 expended or authorized for capital improvements during 1922 and 1923.

Class One railroads in 1923 also expended for fuel, materials and supplies used in current operation and maintenance approximately $1,800,000,000, compared with $1,668,573,271 in 1922. This amount was expended in addition to expenditures made on capital account for increasing their facilities made almost entirely from borrowed money.

This means a total of $3,176,704,459 representing capital expenditures or authorizations in 1923 for increasing facilities plus expenditures in that year for fuel and materials and supplies used in current operation and maintenance. This amount has gone to the industries of the country and represents one of the main reasons for the expansion of business and the employment of industrial labor, which in turn has been a prime factor in the increase in domestic demand for both products of industry and of the farm.

There was also a substantial improvement in the condition of railway equipment at the end of this year, reports showing that on Dec. 1, the latest date available, 155,626 freight cars or only six and eight-tenths per cent of the ownership were in need of repair. This was a decrease of 60,385 cars compared with the number in need of repair on Jan. 1, at which time there were 216,011 or nine and one-half per cent. This shows that the railroads were not only able to keep pace with the current repairs, despite the fact that traffic was the greatest in history, while at the same time they were able to bring about a reduction in the number of cars in need of shopping. Of the total number on Dec. 1, only 116,697 or five and one-tenth per cent were in need of heavy repair.

Locomotives in need of repair also showed a substantial decrease, there having been on Dec. 1, 10,572 or sixteen and four-tenths per cent of the ownership in need of repair compared with 15,549 or twenty-four and one-tenth per cent on Jan. 1.

## Economy in Super-Power Says Murray

The annual saving to American industry through super-power operation will be $190,000,000, in the opinion of William Spencer Murray, chairman of the Government's Super-Power Survey. Mr. Murray quoted these figures before 500 business men and industrialists of Philadelphia at a Chamber of Commerce meeting.

The figures were based on the estimated cost of super-power in operation as of 1930. By that time there should be sufficient development of giant power operations to bring about that and other economies, Mr. Murray believed.

## Cincinnati Bickford Co. Fifty Years Old

On the occasion of the fiftieth anniversary, the Cincinnati Bickford Tool Co., Cincinnati, Ohio, has sent out the following announcement to its friends:

"The Cincinnati Bickford Tool Co., Cincinnati, Ohio, takes pleasure in announcing its entrance upon the second half century of its career as a designer and manufacturer of metal drilling machinery.

"If the test of character is success, and the final test of success is permanence, we may venture to hope that the ensuing years will prove as fruitful in the formation of friendships, and the establishment of cordial business relations, as we have enjoyed in the past.

"Life without amity is destitute of enjoyment. It is for this reason that we value our friends so highly, and are taking this means of assuring them of our unfaltering esteem.

"August H. Tuechter, President."

# Machine Tool Trade in Sweden

Prior to the war, the Swedish machine-tool industry was of relatively small proportions, the imports greatly exceeding the exports, but the great demand for equipment of all types resulting from the war caused this industry to grow rapidly, states Trade Commissioner H. Sorensen, Stockholm, in a report to the Department of Commerce. Since the war many adverse conditions have been encountered; and while the volume of production and of exports has decreased, the business in general has maintained, by a reputation for superior quality, a much higher level than in pre-war years.

While most types of tools are manufactured, the most important, both from the standpoint of domestic consumption and exportation to foreign countries, are lathes, milling machines, drilling or boring machines, shapers, and planers.

### Swedish Lathes

Makers of lathes are turning out both a high-class product and a cheaper grade. In general, however, Swedish lathes compare favorably in price, quality considered, with those made elsewhere. Recent prices on Swedish lathes have been below American quotations on similar machines, and as a result of this and the strong German competition of earlier months, it has been almost impossible to sell American lathes in Sweden. German competition, however, is rapidly diminishing in the Swedish market.

Grinding machines are not manufactured to any great extent by Swedish firms. German and Belgium manufacturers secure most of this business at prices which, in the case of German machines, range from 35 to 50 per cent below American prices.

Exportation of Swedish machine tools was formerly handled by a joint selling organization, but this is gradually disintegrating. Probably no other important Swedish industry has been affected so much by the recent depression as has the machine tool industry. The crisis has been more severe and of a longer duration than in other lines, a few of the adverse factors being the loss of the Russian market, high cost of production (due principally to high wages), large stocks of finished products, unfavorable exchange, German competition (now declining), and the large quantities of secondhand machines which have appeared on the market as numerous firms have failed.

The influence of sales of secondhand machines is indicated by the fact that in the latter part of 1922 machines valued at 12,000 crowns were offered for as low as 3,000 crowns. The usual discounts on this secondhand equipment were from 40 to 75 per cent.

# Many Inquiries and Business Expected in New York Market

## *Business for the year better than in 1922*

The holiday season is being felt by the machine tool dealers in the New York district this week and the number of actual orders received was exceedingly small. But the number of inquiries both this week and last has been most gratifying and dealers are all of the opinion that spirited buying will be started soon.

A few sales were made this week on some lists that have been out for some time. The General Electric Co., that has been buying all year, placed a few orders for necessary tools for the Schenectady and the West Lynn shops and there has been reported some little railroad buying, but nothing of an extent to cause comment.

New York City dealers estimate that their business has been from 20 to 25 per cent better this year than it was in 1922 and they are looking forward to still further improvement during the coming year. It is pointed out that the automobile and railroad buying should remain the same and that marked improvement is expected in the general industrials and the automobile parts makers. A falling off in buying in the locomotive building and ship building shops would not be unexpected.

Dealers in used machinery report a satisfactory year.

Much interest is shown in exporting and the possibilities of business in this direction during 1924. With Germany out of the competition and some other European countries being more or less handicapped, it can readily be seen that machine tool builders in the United States have a better chance than usual for pushing this end of the business with more energy than usual during the coming year.

# Milwaukee Gets Many Inquiries

It is, of course to early in the history of the new year to determine the course of the market for metalworking machinery, but the revival in inquiry since the passing of the holiday season is accepted as a favorable sign of definite improvement in the machinery business. It is not likely that prospective buyers who have been putting out inquiries for several weeks past will act upon the responses immediately, for most shops which closed Dec. 22 for the customary holiday recess will not resume active operations until Jan. 7 and being still engaged in the arduous duties of making inventories, are momentarily too absorbed to give the consideration to the purchase of additional equipment that would make for substantial activity in the tool market.

### Better Business

General opinion relative to business in 1923 places the volume at an excess over 1922. Analysis indicates that the first half of the past year averaged better than either half of 1922, but there was a slow decline in demand during the last half which made considerable inroads upon the average for the entire twelve-month. Round lot business, which appeared as a high light in the character of sales during the early part of 1923, became a rarity after June 1 and the major part of sales consisted of single items during the last few months of the old year.

No single classification of industry employing metalworking equipment purchased new tools in 1923 in a quantity exceeding that of automobile manufacturers. This industry remained a principal factor in sales throughout the period of declining demand, and it appears that it will continue, judging by the renewal of inquiry from this source.

So far as local equipment manufacturers are concerned, the demand from railroads and makers of railroad materials has been disappointing, although it must be said that hopes for a heavy demand in this direction were somewhat enthusiastic to begin with.

One of the largest single orders ever placed for electric traveling lumber handling cranes was awarded to the Pawling & Harnischfeger Co., Milwaukee, by the Long Bell Lumber Co. for use in its new mill at Longview, Wash. Twenty-one cranes and hoists and 7,000 ft. of the special monorail track with seven two-way switches were ordered, and with this equipment all of the outgoing shipments of lumber and timber both for domestic and export trade will be handled. The equipment will be placed at the head mill, the railroad timber dock, at some of the kilns and in the lumber sheds.

# Business Increases in Buffalo

Dealers in the Buffalo district became exceedingly optimistic as the end of the year approached, the unusual volume of substantial inquiries for Spring delivery having raised their hopes higher than they have been for some time past. December in the machine tool trade has as usual been somewhat of a light month, although no lighter than usually in this case. However, the number of inquiries for new and used machinery to be delivered in February, March, April and later is much larger than it has been at any time since last Spring. One dealer said that he had four to five times as many inquiries at this time as he had in December of last year, most of it for delivery in February or March.

While many of the present inquiries are for small tools, the manufacturers are asking for these in such quantities as to indicate an exceptional Winter and Spring season being ahead. One good indication is that the larger part of these inquiries come from general machine shops, rather than from any one line.

One large automobile company's recent announcement that it would make a new model car next year has been taken by the trade to mean that considerable new machinery will be bought for plant additions early in the year. However, in this case, the manufacturer has not yet made inquiry and the company has stated that it will not be ready to prepare definite specifications for some time to come.

One woodworking shop is expanding somewhat and has recently purchased the bulk of some 40 used machine tools which are part of a lot that a Buffalo machine tool distributor is disposing of in liquidating the assets of a Rochester machine tool corporation.

One of the biggest recent sales consisted almost entirely of large punch presses and dies, the transaction being reported at something more than $300,000 and the purchaser a manufacturer of heating equipment.

In general 1923 has been a fair year for Buffalo tool dealers, in spite of a slackened business during some of the Fall months. In most cases the first of the year started off with a rush and business kept increasing until it reached its peak in May. Then it tapered off rather gradually and the Summer months were dull. September did not show the increased business that it normally should have and the other three months have been jumpy, with no one reporting any great volume of business.

# Canada Looks for Big Year

Two recent announcements which adequately reflect the expansion of industry in Canada are the monthly statement of the Canadian National Railways showing a net increase of 133 per cent in the November earnings, and the annual statement of the Canadian Car & Foundry Co. showing that in addition to the remarkably high earnings of 18.1 per cent on the common stock, the company started the new year with $7,500,000 of unfinished business on its books, considerably more than at the beginning of the previous year.

### Canada Thankful

The approach of the new year, while accompanied by the usual holiday slackness in some lines of business, finds industrial Canada with many things to be thankful for. While many important industrial countries are complaining of depression, Canada's trade has continued to expand and she has no serious unemployment problem. The outlook for the new year is bright, particularly for the machine tool industry. Automobile production promises to go ahead. Ford's new Toronto plant is considering working nights after the beginning of the new year. Russell Motors is making plans for a tremendous drive with its new champion and other models, and General Motors has a big campaign ahead for its various models. Export figures show a constantly growing demand for Canadian passenger and freight automobiles, in the United Kingdom, Australia, New Zealand and the Argentine Republic.

In Toronto the metal working plants have sufficient work on hand to carry them well into the new year, while Montreal fabricators report good structural contracts, which will ensure continued shop work for some time. The fact that melter stocks are low has given the dealers in old material reason for expecting an improvement in busi-

ness shortly. Very little buying has been done in this line during the last month.

Very little railroad buying of machine tools is reported, but considerable activity along this line is looked for during the first half of 1924. Reports of lumbering operations from all parts of the country are encouraging and the demand for machinery from this branch of industry particularly in the provinces of Quebec and British Columbia, is keeping up well.

The Canadian Iron Foundries of Fort William, Ontario, manufacturers of brake shoes and special railway equipment, are in the market for equipment for a foundry and furnace room to replace fire loss. The Riverside Iron Works of Calgary, Alberta, have commenced work on a plant for the manufacture of transmission equipment, and general repair work in connection with tractors, etc. The Beaver Truck Corp., Hamilton, Ontario, has commenced building operations on a $1,500,000 factory in Brampton, Ontario.

## Detroit Ready for Record Year

The past year leaves a record in Detroit's industry that will not be soon forgotten by those who have been closely identified with the phenomenal prosperity which this center of the automotive industry has enjoyed during the past twelve months.

Just at present, between the two holidays, there is a material lull in business and a let-up in industrial activity. It is only temporary, however, and full complements of men will move the wheels again the first of the year.

During 1923, the automobile business was 50 per cent greater than during 1922, the banner year previous to this one. Its holiday happiness was caused not merely from the fact that more than four millions of cars were sold, but because it found a ready market for them, even then failing to satisfy all who required cars.

Pessimistic statements to the effect that sooner or later the automobile industry will burst are discounted here as the industry's twenty-fourth birthday shows it to be on a solid financial and credit basis.

Detroit manufacturers without exception are looking for another banner year. As Alvan Macauley, president of the Packard Motor Car Co., puts it:

"Every indication points to one of the best years in the history of the automobile industry. The year 1924 will be a most substantial one for those companies, which like a majority of motor car builders, are in a position to take advantage of the opportunities before them.

### Detroit Prosperous

"The general prosperity of the city, very largely at least, reflects the condition of the motor car industry so that in attempting to look into the future to see what it holds in the way of prosperity for Detroit, it is well first to consider what the prospects are for a continuation of the present tremendous production of motor cars by the city's factories. Its auto factories are teeming with busy workers and the drone of machinery turning out cars may be heard throughout the city day and night. There is no question about the high tempo of the city's whole machinery equipment right now and at no time has the number of men at work producing automobiles in Detroit been higher."

Widespread interest is being manifested in the forthcoming national automobile shows in New York, Detroit and Chicago. Announcements which are expected to vitally affect the industry will be made by some of the larger manufacturers at this time.

## Steady Business in Chicago

Floor sales have been good this week and inquiries are increasing. Dealers look for a large volume of business after Jan. 1. The Sullivan Machinery Co., recently moved from Chicago to Michigan City, Ind., has placed orders for a turret lathe, three engine lathes, two radial drills and two horizontal boring mills. The Pettibone-Mulliken Co., Chicago, has purchased two horizontal boring mills, an 18-in. lathe and a shaper; and a 42x42-in.x16-ft. planer.

Used machinery is moving rather slowly, although a couple of dealers report fairly good floor sales.

Railroad inquiry and buying continues to take a leading part in the machine tool market. The Southern Ry. is inquiring for a double head axle lathe, two car-wheel truing lathes, one 18-in. tool room lathe, four 16-in. lathes, one 20-in.x12-ft. engine lathe, two 36-in. engine lathes, one 24-in. heavy duty lathe and two 48-in. punches. The Chicago Great Western Ry. has purchased a 66-in. vertical milling machine. The Western Electric Co., Chicago, has bought a 5-ft. boring and turning mill. The American Car & Foundry Co., Chicago, has purchased a side head boring mill. The Union Pacific Ry. is inquiring for a centering machine in addition to machines previously mentioned and has purchased a hydraulic combination mounting and demounting wheel press. The Chicago, Burlington & Quincy R.R. placed an order with an eastern manufacturer for a 42-in. planer, and purchased locally two 54-in. vertical boring mills, two pattern makers' lathes, and two used guide bar grinders. The Santa Fe R.R. is preparing an extensive list for machine tools in connection with expansion of its San Bernardino, Calif., shops. The Kansas City Southern Ry. has purchased a motor-driven 18-in. engine lathe.

### Steel Mills Busy

Chicago steel mills are maintaining their output at between 75 and 80 per cent of capacity. Railroads are coming into the market for cars and track fastenings and automobile manufacturers have taken a large tonnage during the week.

Machine tool builders and dealers agree that the future is brighter than it has been in the Chicago district in some months and that 1924 is starting off better than any year in a long, long time. Railroads, automobile parts makers buying and general industrials in the cities near here are all planning purchases after the first of the year and there are very few clouds on the commercial sky in this section.

## Jordan Toastmaster for S.A.E. Dinner

Although the annual session of the Society of Automotive Engineers will be held in Detroit this year during the Detroit automobile show, this fact will not affect the great institution, the annual dinner, that will be held in the Hotel Astor, New York City, Thursday evening, Jan. 10 at 6:30 o'clock.

The society has obtained E. S. Jordan, president of the Jordan Motor Car Co., as toastmaster for this occasion. "Ned" Jordan is noted for his rare fund of humor and sound sales logic.

Dr. M. L. Burton, president of the University of Michigan, will be the principal speaker. He has chosen as his subject "That Mind of Yours," and he will tell of the important problems facing the world today and each individual's responsibility in being fit to solve them.

A. C. Bergman, district manager of the C. G. Spring Co., Kalamazoo, Mich., is chairman of the committee in charge of the details of the annual dinner.

## German Competition Is Lessening

Germany is practically eliminated as a competitor in the sale of machinery in the foreign field during 1924, in the opinion of W. H. Rastall, the chief of the industrial machinery division of the Department of Commerce. As a result, his advice to American manufacturers is to take full advantage of this opportunity to extend their operations into those countries once dominated by German manufacturers. "Go in and dig in," is the slogan which he suggests that American machinery manufacturers adopt, as a New Year's resolution.

During 1923, despite the adverse conditions arising from abnormally low prices for Latin-American raw materials, machinery exports to those countries from the United States increased 17 per cent. The increase is well scattered among the 95 classifications into which machinery exports are divided. Exports to China have fallen off, but those to Japan and India have increased. World conditions are such as to indicate a considerable expansion in machinery purchases during 1924.

## Prominent Speakers on Safety

At the joint meeting of the Engineering Section of the National Safety Council and the American Society of Safety Engineers, to be held Jan. 22 at the Engineering Societies Building, New York City, the subject of material handling and its hazards will be discussed. Among the speakers who are scheduled for the morning session are: David S. Beyer, George C. Agry, A. L. Lewis, and Ralph E. Prouty, who will act as chairman.

The afternoon session will be devoted to several subjects, prominent among them, welding. D. H. Deyoe of the General Electric Co. and H. S. Smith of the Union Carbide & Carbon Corp. will be among the speakers in the afternoon.

# The Business Barometer

## *This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments*

**By Theodore H. Price**

Editor, *Commerce and Finance*, New York

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AS THE old year ends and the new year commences, it is natural to look both backward and forward, although looking backward is generally profitless in a country that changes and progresses as rapidly as ours. But 1923 has just a few aspects that should be noted. One is the remarkable increase in the resources of the building and loan associations as well as in the savings bank deposits and life insurance written that the year shows. These are indications of a very real prosperity.

Another important development is the improvement in the relations of employees to employers that has been brought about. Speaking at a dinner recently, Charles M. Schwab said that it was the most striking social achievement of his lifetime and thinking men must agree with him.

For the rest our domestic history records but little that is unusual in its economic aspect, nor does anything that has happened in Europe call for much interpretative comment. During the year the mark has become worthless and a recent letter from Bremen tells the following story of the monetary chaos existing there:

"We are now running our Bremen dollars in denominations of 1c., 2c., 5c., 10c., 20c., 25c., 50c. and one dollar notes. Each note carries on its face the equivalent value in gold mark, i.e., 1 cent = 4.2 gold pfenning. 1 dollar = 4.20 gold mark. We have prices now in cents, renten marks, paper marks, grund marks, roggen marks, English pounds and Dutch guilders."

In France the conditions are not quite so confusing, although the gold value of the franc has declined from over 7 cents to less than 5 cents during the year and there are many who think it is destined to follow the mark. The hope of collecting anything substantial from Germany on account of reparations is gradually becoming an irridescent dream and it begins to seem possible that the antagonisms of Continental Europe may slowly disappear simply because the people are getting weary of hating and fighting each other.

The internal and external debts owed may meantime evaporate as the currencies in which they are payable lose their purchasing power. This is what happened to the Bourbon debt of France, created before the French revolution, and it may be that for once history will repeat itself.

But amid the chaos John Bull remains the chief and almost the only exponent of financial integrity that is to be found among the European nations who fought the war. He is paying his debts and by meeting his obligations he is recovering the confidence and the trade that he enjoyed prior to 1914. That he will somehow "muddle through" the financial morass by which he is surrounded may be taken for granted, for though he growls and groans he "carries on" with his traditional persistency.

Looking to the future the view is also obscured. In this country the conservatives are as usual afraid of the radicals and since the former control most of the capital available there has not been nor is there likely to be any excessive speculation. The markets are, in fact, suffering from what someone called a hypochondria of fear, which is due to the agony and losses of 1920 and 1921. In time the experiences of that period will be forgotten, but it is still a very vivid memory whose restraining influence is likely to be felt for another year or two.

"Looking ahead one is therefore compelled to admit that there is nothing very disconcerting in sight and that barring accidents or cyclones that cannot be foreseen, the promise is for a normal year with enough cloudiness to make us appreciate the sunshine, enough storms to kill monotony of fine weather and enough adversity to make us saving when we are prosperous, as we are likely to be most of the time."

If we could eliminate the human and psychological element from the economic mechanism it would probably function very smoothly for it has rarely been in better condition, although like all machines it has to be constantly watched and frequently adjusted. Just at present the price of cotton and some other agricultural products are a little out of adjustment. Cotton is too high and wheat is too low, but "Doctor Supply" is already in consultation with "Doctor Demand" about these disorders and a remedy will soon be found for them.

The other staple commodities are about where they should be. Distributive trade is good. Credit is abundant and the Christmas week statement of the Federal Reserve Bank shows a seasonal increase in the demand for both gold and Federal Reserves Notes that has reduced the reserve ratio to 73.3 per cent. It will probably rise again after the New Year when we will have again to face the problem created by our redundant supply of gold.

The stock market has not yet recovered the barometric character that used to be attributed to it. It is a question whether it will ever do so. Every time it holds up its head some scandal threatens its popularity afresh. Last week the story of a young speculator who claims to have made a fortune by operations conducted via cable from the antipodes was the sensation. It will probably lead to a governmental investigation.

On top of it came the collapse in a manipulated oil stock dealt in on the curb and the refusal of an oil magnate to reveal the facts for which a Senate Committee is seeking in an effort to determine whether there was any impropriety in the sale of a great oil field formerly owned by the government. The effect of these happenings is to discredit stock speculation generally.

Were it not for this condition the railroad stocks would probably be much higher for both earnings and traffic are larger than ever before and the future of the roads is more promising than for years. The executives are, however, still afraid that the strong railroads will be compelled to take over the weaker properties and this fear is about the chief and only reason why railroad securities are neglected.

Insofar as the future may be inferred from the recent past, it seems reasonable to expect that during the coming year the stock market will follow rather than lead the other markets and if general business continues good an advance in the value of well-seasoned securities may be safely reckoned upon.

But it is not so easy to generalize about the future of Europe. Much depends on the course of the French franc, which rose to 5.12½ on Thursday after selling at 4.99½ on Wednesday last. As previously pointed out the French debt, including the franc notes outstanding, now amounts to some 500 billion francs, whose present value is about equal to 25 billion dollars.

But this is about the only disturbing feature of the European situation that is novel. There are many other phases that are distressing, but we are accustomed to them. They have lost their terror for us and the fact that our exports are bought and paid for as needed seems to indicate that the people on the other side of the Atlantic are better off than their governments.

Looking ahead one is therefore compelled to admit that there is nothing very disconcerting in sight and that barring accidents or cyclones that cannot be foreseen the promise is for a normal year with enough cloudiness to make us appreciate the sunshine, enough storms to kill the monotony of fine weather and enough adversity to make us saving when we are prosperous, as we are likely to be most of the time.

# Economic Prospects of 1924

## *An authoritative survey of conditions that are shaping our future business*

**By Herbert Hoover**
Secretary of Commerce

THE IMPORTANT thing in formulating any judgment as to the economic future is an understanding of our present position and of the forces that are in motion for and against economic progress. The following summary is based on the annual review by the Department of Commerce representatives throughout the world.

The economic outlook for our own country for the next year is bright. In general the world situation is hopeful. The general spirit of prudence, the absence of speculation, complete employment, high production, and the great financial strength and stability of the important states in the Western Hemisphere, together with the promise of the early conference for systematic consideration of constructive solution of the world's greatest economic menace—Franco-German relations—all create a hopeful foundation on which the New Year may build.

An economic weather chart of the world would show three distinct areas.

First, the Western Hemisphere, Asia, Australia, and Africa, which have made distinct economic progress during the past year, achieving a high degree of economic recovery.

Second, Russia, the Baltic, the Balkan States, the Near East, Italy and Spain, which are still struggling with afterwar political, social, currency, debt and budget problems, but yet show undoubted progress in the restoration of commerce and industry.

Third, an area of economic depression resulting from the occupation of the Ruhr and the collapse in Germany. While most acute in that country, it radiates its depressing influences strongly over Poland, Czechoslovakia, Switzerland, Hungary, Scandinavia, Holland, and Great Britain. France can well be placed in this group because the failure to secure reparations has contributed to an unbalanced budget and the resulting indirect inflation. This has concealed the true situation and has given an artificial and forced draught to the industrial activity. The other countries of the group are suffering from a distressing increase of unemployment.

### Germany Buys Less

The German collapse has in less degree affected every other part of the world. The decreased consuming power of Germany and of the states most affected has contributed to the low price levels of food products in the United States and other food exporting countries. The decrease in her steel and coal production at first gave some stimulus to the production of other countries, but this is now offset by decreased buying power of the depressed area for other commodities. One other effect of importance has been the undoubted substantial flight of capital from many of the states in this area of depression to the United States, resulting in further excessive accumulation of gold here. The economic world has not yet felt the full impact of the occupation of the Ruhr. Were it not for the hope inspired by the initiation of negotiations for settlement of the German problem, the situation would be most unpromising for the future.

### The Readjustment Period

Even with settlement accomplished, there will arise considerable problems in readjustment of trade through reentry of German coal and steel into the markets and through the possible (and to be hoped) return of capital which has sought refuge in the United States from many parts of Europe. During the whole year passed the events of the depression area have at least served to inspire caution in the rest of the world and have contributed to the absence of speculation and, therefore, to their fundamental stability. If it be possible to reconstruct Germany's finance during the forthcoming year and to secure such assistance to France as will enable the stabilization of the franc, the world will have entered into a period of great hope and much promise of prosperity. Full consummation cannot, of course, be accomplished without a large measure of disarmament in Europe, for the armies today maintained by 170 million people there are upon a scale which if repeated in the Western Hemisphere, would mean 3,000,000 men under arms—a strain that would have made recuperation almost impossible on this side of the Atlantic, even with the economic strength possessed by this Hemisphere.

Russia is slowly making progress with the inch by inch abandonment of communism and socialism. War has ceased in the Near East. Greece and Turkey are turned toward progress. The eastern states of Europe are sensibly approaching sound projects for stabilization of budgets and currency. China is still disturbed politically, but her commerce is maintained despite of it. The Japanese disaster has had less effect upon her economic stability than many anticipated and has furnished new proof of the great strength and courage of that country. Latin America is steadily increasing in productivity, but currency conditions in some instances leave much to be desired. Except in Mexico, there has been a steady increase in political and social stability.

Our own country has shown more freedom from depressing European economic influences than most others. The explanation lies in the fact that, although our exports are of profound importance, less than six per cent of our total productivity is exported and of this only about one-half to Europe. The proportion of different products exported to Europe, of course, varies and European conditions, therefore, have a fluctuating influence upon different industries. As less than one per cent of our manufactured products find their market in Europe, the direct effect upon these industries is more negligible than upon certain agricultural products which are much more dependent upon European consumption, such as wheat and pork products, and we endure both economic and political reactions at home from this latter fact.

In 1923 the United States have witnessed the highest total productivity and movement of commodities since the war, with full employment, high real wages, greatly increased savings, large additions to home building, and the largest increase in railway equipment since the war. The whole has been accompanied by a remarkable absence of speculation, consequent over-accumulation of consumable goods or dangerous expansion of credit. As we are not in a boom we can expect freedom from a slump. Some secondary interrogations can be raised as to the effect of the expansion of instal'ment buying of consumable goods, the acute suffering in the Northwest agricultural areas, the increase on stocks of some commodities, and decrease on some advance orders. These items are small compared to the whole industrial fabric. Taking the country as a whole we never in history have enjoyed a higher standard of living and comfort, nor so great a degree of commercial and industrial efficiency as today or so wide an understanding of the forces which control the ebb and flow of busines. As severe as the situation is in the worst of the agricultural states, yet the disparity between agricultural prices as a whole and industrial commodities is gradually lessening and the economic balance is tending to right itself.

### Foreign Trade Gains

A more detailed examination of our own situation based upon the first eleven months, and some later data, indicates that our foreign trade will show about $4,100,000,000 in exports and about $3,800,000,000 in imports—an increase of seven per cent in the former and twenty per cent in the latter over 1922. The merchandise balance will be about $300,000,000 in our favor. Net gold and silver imports will be about $260,000,000 or, on the face of these figures, almost a full liquidation of the trade balance. On the other hand, our very large net expenditure upon tourists, emigrant remittances, and other current invisible items have been apparently liquidated by the very considerable flight of capital from Europe. Our publicly issued loans to foreign countries and enterprises have been about $300,000,000 net for the year, as

compared to over $600,000,000 last year.

Our manufactured production taken together will show about ten per cent higher than 1920 and fifteen per cent higher than 1922. The 1923 production of coal and coke shows a great increase, but the strike in 1922 prevents any useful comparison with last year. Production for this year increased over 1922 by about forty per cent in iron and steel, about fifty per cent in copper, about sixty per cent in automobiles, about fifteen per cent in rubber tires, about ten per cent in lumber, about twenty per cent in cement, about twenty per cent in sanitary ware and about ten per cent in leather.

In construction work the large additions to our railway equipment have enabled the railways to fully handle the traffic for the first time since the war, and marks a great achievement. In building there has been about the same floor space constructed, but there has been a great shift from public construction to make way for private work, as indicated by the decline of over twenty per cent in public building construction, and an increase of about fifteen per cent in residential buildings compared to 1922. This shift from public to private construction is also indicated by the fact that concrete road contracts declined about sixteen per cent while the output of cement, however, increased as above.

The national debt has been reduced about one billion dollars during the year; bank debits to individual accounts remained about the same in New York, but increased about twelve per cent in the rest of the country. The money in circulation apparently increased about six per cent. Member banks show an increase of about six per cent in loans and discounts. The reserve ratio is about the same as a year ago, that is about seventy-six per cent. Savings increased about ten per cent and life insurance sales about twenty-two per cent. The financial items, therefore, show a general parallel with increased production without inflation.

In summary, the world situation continues under the European cloud of the reparations dispute, unbalanced budgets, unstable currencies, and the political uncertainties of armies in the old allied states greater than prewar. Yet the realization of the necessity to constructive solution of reparations, the constructive aid to Austria and Hungary, and the projects for budget reorganization in other countries, all give hope that we have at last taken a turning.

Our own country has exhibited extraordinary strength and progress. The basis of healthy business activity lies in balanced budgets, stable currency, high production accompanied by proportionate consumption and savings with an absence of speculation, extravagance, and inflation. These things we have in the United States. We have even more in the hope of decreasing taxes. The odds are favorable to 1924.

In transportation, car loadings were increased by about fifteen per cent. Cargo traffic through the Panama Canal doubled, it increased forty per cent through Sault Ste. Marie and thirty per cent through the Erie Canal.

Consumption is indicated by the increase in sales of mail order houses by about thirty per cent, in chain stores eighteen per cent and department stores about ten per cent over 1922. Postal receipts were ten per cent greater.

The stocks of goods generally at the end of this year are somewhat higher than at the beginning of the year and unfilled orders for steel are lower, as are orders for railway equipment. But the large employment bids fair for large continued consumption of goods.

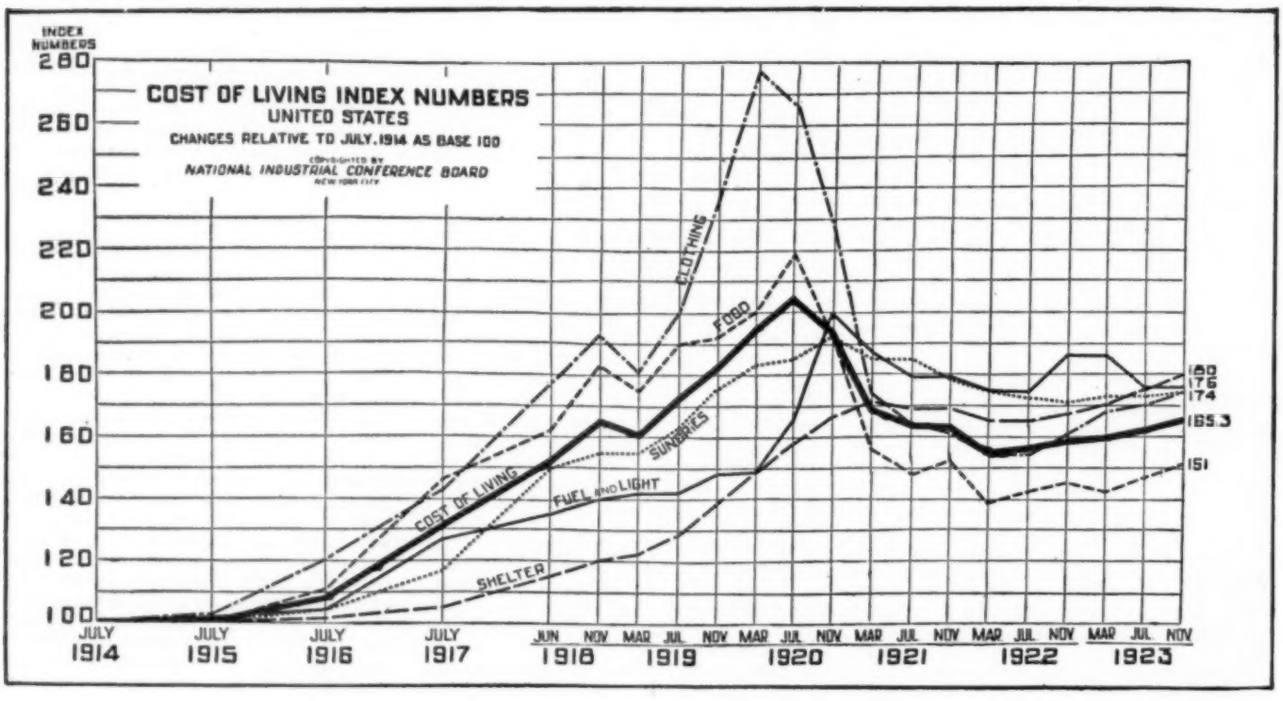
Price levels maintained comparative stability. Wholesale average prices of all commodities declined about three per cent for the year and stand fifty-two per cent above 1913. Average prices for ground crops increased fifteen per cent while live stock declined about seven per cent. Retail food prices increased during the year about four per cent and the Labor Department Cost of Living Index would show an increase of about four per cent.

# Industry and Workmen Both More Prosperous Says Industrial Board

American industry approaches the New Year with wages higher than at any previous time in 1923, according to a review of the year's industrial and employment activities issued recently by the National Industrial Conference Board of 10 East Thirty-ninth St. The Board, which is the research agency in industrial economics for a large number of the nation's leading industrial associations, finds little in the year's course of wages, employment and the cost of living to give cause for immediate concern.

While wages were rising steadily from January last up to November, the latest time when detailed information was available, the cost of living, the board reveals, likewise was advancing, but the advance in wages was enough to more than offset the rise in household and other expenses of the average American family.

Therefore, the Board announces, the actual increase of wages, as balanced with the slightly decreased purchasing power of the dollar during the year,



as caused by the rising cost of living, has brought to the worker in industry a 1923 rise of 3.9 per cent in his weekly wage, and of 8.5 per cent in his hourly earnings.

Summarizing the industrial activity of the year, the Board finds that 1923 has been marked by a general upward movement in wages, with a widespread tendency to increase wage rates, combined with close to capacity production in many industries. The midsummer slackening of production, the Board points out, was followed by a certain amount of curtailment in employment, but wages have so far suffered little reduction on this account, and are now close to the peak point of 1920.

### Wage Increases

Most of the wage increases were in the nature of compensation for the reductions which occurred in 1921 and tended to bring the earnings of these workers closer to the level of those in the highly-unionized industries which had successfully combated any reduction and had maintained high wages throughout the period of industrial depression.

"The latest figures available are for October, but results for the last two months of the year will probably not differ greatly from the October figures," says the Board's statement. "Between January and October, average hourly earnings increased from 50.1 cents to 56 cents, a gain of 11.8 per cent, while average weekly earnings made a gain of 8.2 per cent from $25.08 to $27.14. During the year employment increased as high as 4.1 per cent above the figures for January, but by October, the January level was again reached. An increase of 3.8 per cent in the cost of living during the first ten months of the year, when weighted with the statistical increase in weekly earnings of 8.2 per cent, brought about an actual increase of 3.9 per cent, and 8.5 per cent in real hourly earnings. Thus the wage-earner was considerably better off at the close of 1923 than he was at the beginning of the year."

The advance in the cost of living between September and October was enough to offset the slight advance in average hourly earnings in that month, with the result that "real hourly earnings, or the purchasing value of money earnings, remained unchanged at a point 40 per cent higher than in July, 1914. The sharp increase in weekly earnings advanced "real" weekly earnings to a point 32 per cent above July, 1914, as compared with 30 per cent in September.

### Employment Increases

A slight increase in the latest figures of total employment is sufficient to indicate any well-defined upward trend. In thirteen industries employment increased, in nine it declined, and in one industry it remained practically unchanged. The average week per wage earner increased from 47.7 hours in September to 48 hours in October and the nominal week advanced from 49.5 hours to 49.6 hours. The average week of plant operation declined slightly from 49.5 hours to 49.3 hours.

During 1923 the Board finds that the cost of living has shown a definite tendency to advance, even though the movement has not been consistently upward. Fluctuations from month to month have been largely seasonal, however, and in November, 1923, prices of those goods and services which enter into the consumption of families of small and moderate means averaged 4.4 per cent higher than they were a year ago. In November, 1923, the cost of living was 65.3 per cent above the July, 1914, level, but had declined 19.2 per cent from the peak of high prices reached in July, 1920. This is the highest point reached by the cost of living since May, 1921.

A number of factors contributed to this change. Food prices advanced slightly more than 4 per cent within the year, rents of low and medium price houses went up nearly 8 per cent, clothing prices advanced nearly 9 per cent and increases at various times in the prices of household furnishings and supplies, drugs and candy, sent up the cost of sundries slightly. Only the fuel and light item showed a decline in cost. This is largely because coal prices were at a high level in November, 1922, and have since declined 6.8 per cent, but it is also partly because the cost of gas and electricity has been reduced for small consumers in a number of cities. Electricity rates have shown an average decline of 4 per cent and gas rates nearly 2 per cent within the year.

## U. S. Chamber Plans January Meetings

Important business subjects, including taxation, transportation, immigration and merchant marine, will be discussed at the first mid-year meeting of the eastern division of the Chamber of Commerce of the United States in Philadelphia, Jan. 17 and 18. This will be the first meeting held under the decentralization plan recently put into effect by the National Chamber. Similar regional meetings will be held in January in Chicago, New Orleans and San Francisco.

It is estimated that more than 1,000 leading business men representing about 700 commercial and industrial organizations, will attend the meeting. The eastern division includes all the states along the Atlantic seaboard from Maine to Florida.

Among those who will address the meeting are: Julius H. Barnes, president of the Chamber of Commerce of the United States; Samuel Rea, president, the Pennsylvania System; A. C. Bedford. chairman of the advisory committee of the eastern district, and chairman of the board of the Standard Oil Co. of New Jersey; Willis H. Booth, vice-president of the Guaranty Trust Co., New York, and president of the International Chamber of Commerce; Garrard Winston, under-secretary of the Treasury; Colonel George A. Post, New York.

## Western Iron Stores' Exhibit

An exceptionally fine exhibition of products of interest to the machine tool men of the country was shown by the Western Iron Stores, Inc., of Milwaukee, Wis. Many machine tool builders, dealers and users visited the exhibit and all were enthusiastic in their praise of the showing. The exhibit was varied and included many new models of tools.

## Business Items

The Diefendorf Gear Corp. has moved its shop from Pearl St., Syracuse, to 920 West Belden Ave., Syracuse. The plant now occupies 50,000 sq.ft. of floor space and is located adjoining the West Shore R.R. tracks.

The Chain Belt Co., Milwaukee, Wis., will be represented on the Pacific Coast by the Seattle and Portland offices of the Diamond Chain & Manufacturing Co., of Indianapolis, Ind.

The machine shop department of the Blumer Manufacturing & Sales Co., Monroe, Wis., has been sold to L. G. Carter, for 14 years connected with the business as foreman. The equipment has been moved into other quarters on Courthouse Square and the business will be continued as a general machine and repair shop. Some additions to the equipment are contemplated.

Federal incorporation has been granted to Derby Motor Cars, Ltd., capitalized at $1,500,000, with headquarters in Winnipeg, Canada, the incorporators being Louis Maurice Arsenault, manager; Charles E. Meadows, agent, E. M. Smith, Benjamin Franklin, and John W. Wilton, all of Winnipeg. The company will manufacture a wide range of motor vehicles and accessories.

The Auto Service Tool Co., South Milwaukee, Wis., has been incorporated with a capital consisting of 2,000 shares of common stock without par value, for the purpose of engaging in the manufacture of mechanics' tools of all descriptions, including a number of patented devices designed especially to facilitate service work in garages and repair shops. The incorporators are Lem E. Hendee, R. E. Osterlah and C. J. Lemont.

The Milwaukee Corrugating Co., Milwaukee, Wis., manufacturer of galvanized metal products, steel ceilings, etc., has announced plans for the establishment of a large branch factory in La-Crosse, Wis. It has acquired four acres from the John Gund Brewing Co., La-Crosse, together with several large buildings, which will be remodeled and equipped for the production of sheet metal products. The intention is to complete the improvements so that operations may be started March 1.

The American Manganese Steel Co., Chicago Heights, Ill., has purchased the Queen City Foundry Co., Denver, Col., and plans are being made to increase the capacity of the Colorado plant. The company will be represented in Utah and eastern Nevada by Landes & Co., Salt Lake City; in New Mexico and Arizona by Herbert B. Woolcott, Jr., of El Paso, Texas; and in Colorado by the A. T. Herr Supply Co., Denver.

The Horton Steel Works at Bridgeburg, Ont., Canada, was destroyed by fire Dec. 23, entailing a loss of $75,000. The larger part of the loss was in machinery. The plant was built in 1917 and employed about 150 men, working in two shifts. The company manufactured steel tanks.

The Cleveland branches of the Westinghouse Electric & Manufacturing Co. and the Westinghouse Lamp Co. have consolidated in one building their sales and service departments and their warehouses. The new five-story building, which is called the Westinghouse Electric Building, has 115 ft. on Ashland Road and is 130 ft. deep.

Recent Ontario incorporations include Welland Steel Castings, Ltd., with headquarters in Welland, Ontario, and capital of $100,000. The directors are W. M. German, A. L. Brooks and M. Factley, all of Welland.

The Carle Machinery Co. has opened a warehouse and showroom at 546 East Woodbridge St., Detroit, Mich.

## Personals

H. L. BLOOD, assistant to the chief engineer of the Pond Tool Works of the Niles-Bement-Pond Co., has resigned to accept a position with the Western Electric Co. in Chicago.

FREDERIC B. MENNER has announced the organization of the firm of Menner & Kimball, engineering sales agents of St. Louis, Mo., specializing in material-handling, transport and processing equipment.

GEORGE E. TAYLOR, formerly sales engineer with the R. & J. Dick Co., Inc., San Francisco, Calif., is located in the same city as district manager for the Chain Belt Co. of Milwaukee.

ELDRED E. BESSE has left the Hodgman Rubber Co. to accept a position as mechanical engineer with the Pennsylvania Edison Co., Easton, Pa.

WALTER O. HALL, formerly superintendent and chief engineer for the Golding Manufacturing Co., Franklin, Mass., has resigned to accept a position as chief engineer with the Kidder Press Co., Dover, Del., manufacturer of special printing and paper handling machinery.

WILLIAM B. HEWITT has been elected president and treasurer of the Blake Pump Co., Fitchburg, Mass.

ROBERT P. MCCARTY is the traveling representative in the state of Connecticut for the Ludlum Steel Co., New York City.

ELLIS M. JOHNSTON, St. Louis, Mo., has been named to succeed EDMUND C. MAYO, resigned as vice-president and treasurer of the American Tube & Stamping Co., Bridgeport, Conn. Mr. Johnston is at present connected with the American Rolling Mills Co., Middleton, Ohio, as district manager. He will take over his new duties, Jan. 15.

J. M. BLAKE has been made general manager of the newly acquired Denver plant of the American Manganese Steel Co., of Chicago Heights, Ill.

KENNETH JENSEN has been appointed manager of sales of the newly acquired Denver plant of the American Manganese Steel Co. of Chicago Heights, Ill.

JAMES A. SMITH, general superintendent of the General Electric Co., Schenectady, N. Y., has been chosen head of the Machine Shop Practice Division of the A.S.M.E. for the coming year.

SAMUEL T. HARLEMAN has resigned as assistant to the vice-president and general sales manager of the Atlas Steel Corp., Dunkirk, N. Y., and will be connected with Henry Disston & Sons, Inc., Tacony, Philadelphia, as assistant manager of the steel sales department.

## Pamphlets Received

**Trade Standard Adopted by the Compressed Air Society.** C. H. Rohrbach. 50 Church St., New York City. The nomenclature and terminology adopted by this society as well as compressor speeds, capacity and pressures, installation and care of air compressors and other standards, are contained in this booklet that may be obtained from the secretary of the society, Mr. Rohrbach.

**Manual of Instruction for Welding Operators.** Published by the *Welding Engineer*, 608 S. Dearborn St., Chicago, Ill. This manual contains a complete set of outlines of lessons, exercises and examination for the training of oxy-acetylene welders and electric arc welders. It will be sent free upon application.

**Analysis of Propeller Tests.** Max M. Munk. National Advisory Committee for Aeronautics, Washington, D. C. Report No. 175 of the National Advisory Committee for Aeronautics is a critical study of the results of propeller model tests with the view of obtaining a clear insight into the mechanism of the propeller action and of examining the soundness of the physical explanation generally given. Copies of the report may be obtained upon application.

**Trade Terms and Abbreviations.** The International Chamber of Commerce, Paris, France. The recognized interpretation of trade terms and abbreviations in use in the larger commercial countries is contained in a booklet recently issued by the International Chamber of Commerce at Paris. Copies of the publication, which is both in English and French, are being distributed among the American members of the International Chamber. Non-members in the United States may obtain copies through the secretary, American Section, International Chamber, Washington, D. C.

**Engineering Achievements.** By H. W. Cope. The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa. The achievements of this company is told by the assistant director of engineering, H. W. Cope in a ten-page booklet recently published. The various electrical equipment that this company has perfected and improved during the year, and also the achievements of larger projects are chronicled.

## Trade Catalogs

**Filling Station Equipment.** S. F. Bowser & Co., Inc., Fort Wayne, Ind. Gasoline pumps for filling stations are shown in the various styles that are made by this company. The illustrations are in the same colors that are used by the company. Opposite each page illustration is the specifications and a description of the pump shown.

**Pneumatic Die Cushions for Power Presses.** The Marquette Tool & Manufacturing Co., 319-331 West Ohio St., Chicago, Ill. Diagrams, charts, sectional drawings, halftones and interesting tables of data are to be found in this booklet that has been recently mailed. The subject of cushions is exhaustively told and the many illustrations make this a valuable text on the matter.

**Cranes.** The Whiting Corp., Harvey, Ill. Whiting power house cranes are shown in actual use in this pamphlet that has been sent out by this crane manufacturer. A list of manufacturers and public utility corporations who use these cranes is also included in the pamphlet.

## Export Opportunities

**The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.**

Hoisting winches for dredge work. Penang, Straits Settlements. Purchase. Reference No. 8614.

Automatic screw machines, turning lathes, shaping machines, special models polishing, shaping and boring machines for use in automobile manufacturing, and new models of woodworking machinery, circular saws and planing machines. Vienna, Austria. Agency. Reference No. 8582.

Machinery. Tampico, Mexico. Agency. Reference No. 8677.

Machinery for making metal window frames. Port Elizabeth, South Africa. Purchase. Reference No. 8594.

Machinery and apparatus for power plants, mines, and the metallurgical industry. Vienna, Austria. Agency. Reference No. 8650.

Industrial supplies, technical, especially for brick factories. Amsterdam, Netherlands. Exclusive agency. Reference No. 8626.

## Forthcoming Meetings

**American Engineering Council.** Annual Meeting. Shoreham Hotel, Washington, D. C., Jan. 8 to 11. L. W. Wallace, Executive Secretary, 24 Jackson Place, Washington, D. C.

**American Society of Safety Engineers.** Annual Meeting. Engineering Societies Building, 29 W. 39th St., New York City. Jan. 22.

**Engineering Section of the National Safety Council.** Joint meeting with the American Society of Safety Engineers. Engineering Societies Building, 29 W. 39th St., New York City. Jan. 22.

**American Society for Steel Treating.** Winter sectional meeting. Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

**Society of Automotive Engineers.** Annual meeting, Jan. 22 to 25, at the General Motors Building, Detroit, Mich. Coker F. Clarkson, 29 W. 39th St., secretary.

**American Gear Manufacturers Association.** Spring Meeting, April 28, 29 and 30, 1924. Lafayette Hotel, Buffalo, N. Y.

**Society of Industrial Engineers.** Eleventh annual convention. Buffalo, N. Y. April 30, May 1 and 2. Headquarters, 608 S. Dearborn St., Chicago, George C. Dent, executive secretary.

**American Society of Mechanical Engineers.** Spring meeting. Cleveland, Ohio. May 19, 20, 21 and 22. Calvin W. Rice, secretary, 29 W. 39th St., New York City.

**Southern Supply & Machinery Dealers Association, National Supply & Machinery Dealers Association, and American Supply & Machinery Manufacturers Association.** Triple convention, May 19, 20 and 21, 1924, Hotel Cleveland, Cleveland, Ohio. F. D. Mitchell, secretary-treasurer, 1819 Broadway, New York City.

**Foreign Trade Council.** Eleventh annual convention at Boston, June 4, 5 and 6. O. K. Davis, India House, Hanover Square, New York City, secretary.

**The General Committee of Dividion V, Mechanical of the American Railway Association.** Convention and exhibits. Atlantic City, June 11-18, 1924. V. R. Hawthorne, secretary, 431 S. Dearborn St., Chicago, Ill.

**Railway Supply Manufacturers Association.** Exhibit. Atlantic City, June 11-18, 1924.

**The Lyons Fair.** Lyons, France. March 3 to 17, 1924. Information furnished by Emile Garden, 50 Church St., New York City.

# New and Enlarged Shops

## Machine Tools Wanted

**Ga., Atlanta** — Southern Iron & Equipment Co., 217 Grant Bldg.—one 1¼ to 2½ in. turret lathe.

**Ind., Mitchell** — Wright's Garage, H. Wright, Purch. Agt.—10, 11, 12 or 13 in. quick change bench lathe with chucks.

**Ind., Winchester**—A. J. Goodpaster—one 3 or 4 in. radial drill and a quick change engine lathe with taper attachments, 12 to 16 in. swing, 6 to 8 ft. bed, for machine shop.

**Md., Baltimore**—H. Gamse & Bros., 419 East Lombard St.—automobile repair machinery.

**Mass., New Bedford**—Continental Wood Screw Co., Inc., Mount Pleasant St.—equipment for proposed addition to machine shop.

**Mich., Detroit**—Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—squaring shear for Dept. of Street Rys.

**Mich., Detroit** — E. J. Kovach, Consult. Engr., Office 15, 3513 Woodward Ave.—equipment for small machine shop for general machine work.

**Mo., Kansas City**—Everbrite Stone Co., 2582 Grand St.—shear, punch press and electric welding machine.

**N. J., Weehawken**—S. Blickman, Inc., 536 Gregory Ave.—one No. 5 and one No. 6 Bliss spinning lathe.

**N. Y., Brooklyn**—J. Carpenter, 1069 Fulton St.—engine lathe, 10 in. swing, 3 ft. bed.

**N. Y., Buffalo** — Mainwood Realty Co., 1411 Main St.—equipment for garage repair shop.

**N. Y., Buffalo**—M. H. Mulroy, 75 Pooley Pl.—equipment for garage repair shop.

**N. Y., Elmira**—L. H. Lester, 103-105 West 1st St.—lathe, tools and garage equipment.

**N. Y., Norwich**—Champaign Bros., American Ave.—small tools, lathe, press and equipment for garage and repair shop.

**N. Y., Utica**—N. Liano, 333 Catherine St.—small tools and equipment for general repair shop.

**N. C., Charlotte** — Pyramid Motor Co., Trait and Davidson Sts.—complete machinery for automobile repairs.

**O., Bridgeport** — Dillon Bros. Machine Shop, Main St.—machine tools and equipment for expansion program.

**O., Lima**—Buick Garage Co., 512 West Market St.—tools, press and equipment.

**Pa., Coopersburg**—C. H. Schantz—tools and equipment for automobile repair and paint shop.

**Pa., Edwardsville** (Kingston P. O.)—G. Davis—tools, vise and equipment for garage and repair shop.

**Va., St. Paul**—W. P. Bolton—automobile repair machinery.

**Wis., Kenosha**—P. Pirsch & Co., Fairfield Ave.—machine tools and equipment for proposed $60,000 factory for the manufacture of fire apparatus.

**Que., Montreal**—R. Barella, 346 Duluth Ave., E.—small lathe and tools for garage repair shop.

**Que., Montreal**—L. H. Beaudet, 1224 St. Denis St.—drill and grinder for automobile repair shop.

**Que., Montreal**—J. A. Courtemanche, 1758 Henri Julien St.—equipment for garage repair shop.

**Que., Montreal**—J. A. Martel, 902 Demontigny St., E.—machinery, tools and equipment for automobile repair shop.

**Que., Montreal**—M. Neuman, 34 Colonial Ave.—drill press, emery wheel and stand for garage.

**Que., Montreal**—D. Tremblay, 277 Panet St.—repair shop tools and equipment for garage.

**Que., Rimouski**—L. Banville, St. Pierre St.—repair equipment for garage.

**Que., Rimouski**—G. A. Morin, St. Germain St.—tools and equipment for garage.

**Que., Rimouski**—J. A. Therberge, St. Germain St.—repair equipment and compressor for garage.

**Que., Terrebonne** — Warren Ignition & Equipment Co., Ltd., H. Guay, Purch. Agt.—machinery and equipment for the manufacture of ignition machinery, etc.

## Machinery Wanted

**Ala., Athens**—Johnson Chambers Co.—complete planing mill machinery.

**Ala., Gadsden**—Southern Mfg. Co., Gardner and 10th Sts.—equipment for milling plant addition to lumber finishing mills.

**Ark., Rumley**—The Printer—10 x 15 in. job press.

**Ark., Wesson**—Edgar Lumber Co.—sawmill machinery.

**Ga., Hahira**—The Gold Leaf (newspaper and job printer)—perforator and paper cutter.

**Ind., Indianapolis** — R. J. Heuslein Co., Century Bldg. (printer and engraver)—Colts Armory job press, 14 x 22 in.

**Ind., Rushville**—M. L. McClellan, 3rd St.—stitcher for shoe repairs.

**Ind., Rushville**—W. Perkins, 3rd St.—tinner's brake (used).

**Ind., Shelbyville**—T. J. Marshall, R. F. D. 6 (woodworker)—8 or 10 in. sawdust blower.

**Ind., Westfield**—O. E. Talbert & Son—42 in., 3 drum sander; hollow chisel mortiser; comb; Beach rip and cutoff saw.

**Mass., Lee**—Lee Lime Co.—ovens, conveying machinery, shafting, etc., for proposed $50,000 plant.

**Mass., Taunton**—Whittenton Mfg. Co., 437 Whittenton St. (cotton mills)—several looms, pulleys, shafting, belting, etc., for addition to mill.

**Mich., Flint** — A. O. James, 902½ North Saginaw St.—newspaper press and complete equipment.

**Mo., Kansas City**—Curiosity Shop, 1903 Main St.—wood lathe and joiner for cabinet department.

**N. Y., Big Flats**—F. Cassandia—complete equipment for small candy plant.

**N. Y., Buffalo**—C. De Carlo, 559 7th St.—equipment for bakery.

**N. Y., Buffalo**—T. J. McDonnell, 3103 Bailey Ave.—equipment for the manufacture of candy.

**N. Y., Buffalo** — Truck Equipment Co., 1791 Fillmore Ave.—machinery and equipment, including hangers, pulleys, etc., for addition to plant.

**N. Y., Fulton**—Amer. Conduit Co.—complete machinery and special equipment for saturation plant to replace fire loss.

**N. Y., Geneva** — Finger Lakes Printing Co., 220 Genesee St., S. Cohn, Purch. Agt.—complete equipment, including job printing presses, to replace fire loss.

**N. Y., Rochester**—Union Tool Chest Co., Hand St., G. N. Perkins, Pres.—woodworking machinery and equipment for expansion program.

**N. D., Fargo**—T. G. Nelson—newspaper press and complete equipment.

**O., Bryan**—Delta Screw Products Co.—machinery and equipment for the manufacture of automotive pistons.

**O., Massillon**—Stark Glass Co., H. S. Potter, Genl. Mgr.—glass making equipment for the manufacture of bottles, etc.

**O., Toledo**—Lutz Bakery Co., 201-7 Sylvania St.—machinery and equipment for proposed bakery.

**Okla., Bartlesville**—The Printer, Box 384—newspaper press, belting and hangers (used preferred).

**Pa., Bethlehem**—Wyandotte Cleaning Co., 540 Bway., J. B. Klein, Purch. Agt.—complete cleaning and dyeing machinery, estimated cost $15,000.

**Pa., Scranton**—Scranton Top Co., Walnut St. and Wyoming Ave. (manufacture and repair of automobile tops), E. B. Lewis, Purch. Agt.—machinery and equipment for fire replacement.

**Tex., Dallas**—Amer. Sulphur & Fertilizer Co., Love Field Dist., N. C. Erwin, Purch. Agt.—ore crushing machinery for the manufacture of fertilizers.

**Tex., Houston**—Houston Baking Co., c/o J. Finger, Engr. and Archt., Woolworth Bldg.—oven equipment for proposed bakery.

**Tex., Waco**—Cooper Mfg. Co., Houston St.—36 in. wood planer.

**Va., City Point**—Wilson Hoek Co.—36 in. extractor for laundry, also cotton baler.

**Va., Freeling**—C. S. Beverly—newspaper press, job printing press, belting, hangers and paper cutter.

**Va., Kilmarnock**—Rappahannock Record—typesetting machine.

**Va., Richmond**—Hackley Morrison Co., 1708 Lewis St.—18 to 20 in. extractor for laundry.

**Va., Stuart** — **Patrick Land Co., Inc.** — knitting mill machinery.

**Wash., Seattle**—Loading Mchy. Sales Co., 1526 1st Ave.—9½ x 10 in. duplex loading machinery.

**Wis., Appleton**—Kurtz Motor Car Co., 1107 College Ave.—air compressor and small tools for proposed $40,000 addition to garage.

**Wis., Brodhead**—Steele & Schem—newspaper press.

**Wis., Elcho**—Cabinet Shop, Box 25—hub boring machine.

**Wis., Galesville**—G. Rall Mfg. Co. (cabinet shop)—cylinder head for 24 in. sweep stakes planer and matcher.

**Wis., Madison**—G. Ripp & Son Co., 20 South Bassett St.—mortiser and cutoff saw.

**Wis., Madison**—L. J. Schultz, 1326 West Washington Ave.—cutoff saw and bandsaw.

**Wis., Milwaukee**—A. Schultz, 753 36th St. (woodworking)—planer and saws.

**Wis., Milwaukee**—J. Zens, 522 State St. (manufacturer of hosiery, etc.)—looping machines, shuttles and forming machines.

**N. S., Halifax**—C. A. Leverman & Son, Gorsebrook—portable sawmill.

**Ont., Alexandria**—M. Campbell, Mill Sq.—small tools, air compressor, etc., for garage.

**Ont., Dunnville**—Dunnville Woolen Mills, Ltd., J. J. Heinbecker, Purch. Agt.—complete equipment for mills for the manufacture of flax and cotton goods.

**Ont., Glenroy**—M. Emburg—vise, drill, etc., for blacksmith shop.

**Ont., London**—McCormick Mfg. Co., Ltd., Dundas St., E.—electric ovens and general equipment for handling and mixing biscuits.

**Ont., Ottawa**—Canadian No Blow Out Tube Co., Ltd., c/o W. Johnston, Barrister Trust Bldg.—complete equipment for new plant for the manufacture of rubber tires, etc., at Edmonton, Alta.

**Ont., Schumacher**—Hayden Gold Mines, Ltd., W. H. Hayden, Purch. Agt.—air hoist and compressors for mine at Ogden.

**Que., Cartierville**—B. Vezina, 72 Montee St. Laurent—complete blacksmith shop equipment to replace fire loss.

**Que., Lac au Saumon**—J. Fenderson & Co., T. Berube, Purch. Agt.—sawmill machinery.

**Que., Levis**—Canadian Wood Wks. Registered, 40 St. George St., A. Shaienks, Purch. Agt.—woodworking machinery.

**Que., Levis** — W. Couture, 147 Commerciale St. (manufacturer of shoes)—machinery for expansion program.

**Que., Levis**—H. Michaud, 24 St. Louis St.—vulcanizing equipment.

**Que., Montmagny**—E. Collin, Riviere du Sud—equipment for sash and door factory.

# The Weekly Price Guid

## Rise and Fall of the Market

**Iron and Steel**—Pig-iron demand showing more signs of life in New York and Middle West than in other sections of the country. Iron and steel scrap demand active; prices higher. Steel buyers are evidently taking the attitude that prices will not decline during first quarter of new year. Steel sheet buying greatly increased during last month; demand principally from automobile, railroad and agricultural industries. Tin plate demand fairly heavy; prices unchanged. Bars still quoted at $2.40 base; shapes and plates, $2.50 per 100 lb., Pittsburgh. As low as $2.40, however, has been mentioned on shapes and plates.

**Declines**—Domestic copper market lower; electrolytic, down ⅛c. per lb. in week. Tin down ⅝c.; lower quotations made to meet adjustments in foreign prices; consumption of metal greater than output. Small volume of new buying in lead; price down 35c. per 100 lb. in week.

**Advances**—Zinc market stiffer, owing to advance in ore prices; up 10c. per 100 lb. in New York warehouses. Antimony also advanced 1c. per lb.

## IRON AND STEEL

**PIG IRON**—Per gross ton—Quotations compiled by The Matthew Addy Co.:

| | |
|---|---|
| CINCINNATI | |
| No. 2 Southern | $25.05 |
| Northern Basic | 24.00 |
| Southern Ohio No. 2 | 24.00 |
| NEW YORK—Tidewater Delivery | |
| Southern No. 2 (silicon 2.25@2.75) | 28.00 |
| BIRMINGHAM | |
| No. 2 Foundry | 22.00 |
| PHILADELPHIA | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 24.25 |
| Virginia No. 2 | 28.17 |
| Basic | 24.00 |
| Grey Forge | 24.00 |
| CHICAGO | |
| No. 2 Foundry local | 24.50 |
| No. 2 Foundry, Southern (silicon 2.25@2.75) | 27.00 |
| PITTSBURGH, including freight charge from Valley | |
| No. 2 Foundry | 25.77 |
| Basic | 25.77 |
| Bessemer | 26.77 |

**IRON MACHINERY CASTINGS**—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

| | |
|---|---|
| Detroit | 4.75 |
| Cleveland | 4.75 |
| Cincinnati | 5.00@7.50 |
| New York | 5.00@5.50 |
| Chicago | 5.25@5.75 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

| Blue Annealed | Pittsburgh | New York | Cleveland | Chicago |
|---|---|---|---|---|
| No. 10 | 2.90@3.00 | 4.34 | 3.75 | 4.00 |
| No. 12 | 3.00@3.10 | 4.39 | 3.80 | 4.05 |
| No. 14 | 3.10@3.20 | 4.44 | 3.85 | 4.10 |
| No. 16 | 3.30@3.40 | 4.54 | 3.95 | 4.20 |
| Black | | | | |
| Nos. 17 and 21 | 3.70 | 4.55 | 4.45 | 4.70 |
| Nos. 22 and 24 | 3.75 | 4.60 | 4.50 | 4.70 |
| Nos. 25 and 26 | 3.80 | 4.65 | 4.55 | 4.75 |
| No. 28 | 3.85 | 4.75 | 4.65 | 4.85 |
| Galvanized | | | | |
| Nos. 10 and 11 | 3.85@4.00 | 4.80 | 4.70 | 4.85 |
| Nos. 12 and 14 | 3.95@4.10 | 4.90 | 4.80 | 4.95 |
| Nos. 17 and 21 | 4.25@4.40 | 5.20 | 5.10 | 5.24 |
| Nos. 22 and 24 | 4.40@4.55 | 5.35 | 5.25 | 5.40 |
| No. 26 | 4.55@4.70 | 5.45 | 5.50 | 5.55 |
| No. 28 | 4.85@5.00 | 5.75 | 5.80 | 5.85 |

**WROUGHT PIPE (Welded)**—Warehouse discounts are as follows:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Black | Galv. | Black | Galv. | Black | Galv. |
| 1 to 3 in. steel butt welded | 48% | 34% | 55½% | 43½% | 50% | 37% |
| 2½ to 6 in. steel lap welded | 44% | 30% | 53½% | 40½% | 47% | 34% |

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 34% off.

**SEAMLESS STEEL TUBING**—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0,17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

| O.D. Inches | List Price per ft. | Differential Discount | O.D. Inches | List Price per ft. | Differential Discount |
|---|---|---|---|---|---|
| ½ | $0.09 | 50% | ¾ | $0.16 | 35% |
| ⅝ | .11 | 45% | 1 | .18 | 31% |
| ¾ | .14 | 40% | | | |

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80, less than 1,000 ft., 79.

**MISCELLANEOUS**—Warehouse prices in cents per pound in 100-lb. lots:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Open hearth spring steel (base) | 4.50 | 6.00 | 4.20 |
| Spring steel (light) (base) | 7.00 | 6.00 | 6.00 |
| Coppered Bessemer rods (base) | 6.53 | 8.00 | 6.70 |
| Hoop steel | 5.19 | 4.66 | 4.55 |
| Cold rolled strip steel | 7.50 | 8.25 | 8.35 |
| Floor plates | 5.80 | 5.66 | 5.80 |
| Cold drawn shafting or screw | 4.40 | 3.90 | 4.30 |
| Cold drawn flats, squares | 4.90 | 4.40 | 4.80 |
| Structural shapes (base) | 3.64 | 3.46 | 3.30 |
| Soft steel bars (base) | 3.54 | 3.36 | 3.20 |
| Soft steel bar shapes (base) | 3.54 | 3.36 | 3.20 |
| Soft steel bands (base) | 4.39 | 3.61 | 3.95 |
| Tank plates (base) | 3.64 | 3.46 | 3.30 |
| Bar iron (3.10@3.15 at mill) | 3.54 | 3.36 | 3.20 |
| Tool steel | 11.00 | .... | .... |
| Drill rod (from list) | 55% | 40@55% | 50% |

Electric welding wire, New York. 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ¼, 7.35c. per lb.

## METALS

Current Prices in Cents Per Pound

| | | | |
|---|---|---|---|
| Copper, electrolytic (up to carlots), New York | | | 13.75 |
| Tin, 5-ton lots, New York | | | 48.25 |
| Lead (up to carlots), St. Louis | 7.70 | New York | 7.77½ |
| Zinc (up to carlots), St. Louis | 6.30 | New York | 6.70 |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Aluminum, 98 to 99% ingots, 1-15 ton lots | 25.20 | 27.00 | 28.50 |
| Antimony (Chinese), ton spot | 10.75 | 10.50 | 10.25 |
| Copper sheets, base | 21.00 | 21.00@21.25 | 23.00 |
| Copper wire, base | 16.25 | 19.00 | 16.25 |
| Copper bars, base | 20.00 | 22.50 | 19.50 |
| Copper tubing, base | 23.50 | 27.25 | 23.00 |
| Brass sheets, base | 17.75 | 22.00 | 18.75 |
| Brass tubing, base | 22.00 | 27.00 | 20.50 |
| Brass rods, base | 15.50 | 18.00 | 15.75 |
| Brass wire, base | 18.25 | 22.00 | .... |
| Zinc sheets (casks) | 10.25 | 10.45 | .... |
| Solder (½ and ½), (case lots) | 33.75 | 31.75 | 30.00 |
| Babbitt metal (83% tin) | 52.00 | 57.50 | 48@52 |
| Babbitt metal (35% tin) | 25.00 | 19.00 | 22@25 |
| Nickel (ingot and shot) | 29.00 | .... | .... |
| Nickel (electrolytic) | 32.00 | .... | 35.00 |

**SPECIAL NICKEL AND ALLOYS**—Price in cents per lb.

| | |
|---|---|
| Malleable nickel sheet (base) | 57.00 |
| Hot rolled rods, Grade "A" (base) | 55.00 |
| Cold drawn rods, Grade "A" (base) | 63.00 |

# Shop Materials and Supplies

## METALS—Continued

| | |
|---|---|
| Copper nickel ingots | 37.00 |
| Hot rolled copper nickel rods (base) | 45.00 |
| Manganese nickel hot rolled rods "E"—low manganese (base) | 57.00 |
| Manganese nickel hot rolled rods "D"—high manganese (base) | 60.00 |

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

| | | | |
|---|---|---|---|
| Shot | 32.00 | Hot rolled rods (base) | 40.00 |
| Blocks | 32.00 | Cold drawn rods (base) | 48.00 |
| Ingots | 38.00 | Hot rolled sheets (base) | 42.00 |

**OLD METALS**—Dealers' purchasing prices in cents per pound:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper, heavy, and crucible | 11.75 | 11.00 | 11.50 |
| Copper, heavy, and wire | 10.75 | 10.50 | 10.75 |
| Copper, light, and bottoms | 9.50 | 8.75 | 9.75 |
| Lead, heavy | 5.75 | 5.25 | 6.00 |
| Lead, tea | 4.75 | 4.00 | 5.00 |
| Brass, heavy, yellow | 7.00 | | 7.25 |
| Brass, heavy, red | 8.75 | 9.25 | 9.00 |
| Brass, light | 6.25 | 5.00 | 6.25 |
| No. 1 yellow brass turnings | 7.00 | 5.75 | 6.75 |
| Zinc | 3.75 | 2.75 | 3.75 |

**TIN PLATES**—American Charcoal—Bright—Per box.

| | | New York | Cleveland | Chicago |
|---|---|---|---|---|
| "AAA" Grade: | | | | |
| IC, | 20x28, 112 sheets | $25.10 | $22.85 | $18.50 |
| "A" Grade: | | | | |
| IC, | 20x28, 112 sheets | 21.40 | 18.00 | 17.00 |
| | Coke Plates—Primes, 20x28 in. | | | |
| 100-lb., | 112 sheets | 14.00 | 13.00 | 14.50 |
| | Terne Plates—Small lots, 8-lb. Coating | | | |
| IC, | 14x20 | 8.25 | 6.55 | 7.40 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb. | $0.11@0.14 | $0.15 | $0.14 |
| Cotton waste, colored, per lb. | .09@.14 | .12 | .10½ |
| Wiping cloths, 13¼x13¾, per lb | 9.00 | 36.00 per M | .16 |
| Wiping cloths, 13¼x20½, per lb. | | 52.00 per M | .16 |
| Sal soda, per 100 lb. | 2.40 | 2.25 | 2.65 |
| Roll sulphur, per 100 lb. | 3.60 | 3.25 | 3.50 |
| Linseed oil, per gal., 5 bbl. lots | .95 | 1.00 | .94 |
| Lard cutting oil, 25% lard, per gal. | .55 | .50 | .67½ |
| Lard oil, pure, per gal, 2 to 5 bbl. lots | .76 | .73 | .71 |
| Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal. | .29 | .35 | .40 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls). | | | |
| Leather—List price, 2c. per sq.in., per ply: | | | |
| Medium grade | 30–10% | 30–10% | 30–10% |
| Heavy grade | 20–5–2½ | 30% | 20–5–2½% |
| Rubber and duck: | | | |
| First grade | 50–10–5% | 50–10% | 40–10% |
| Second grade | 60–5% | 60–5% | 60–5% |
| Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets: | | | |
| Flint paper | $6.30 | $5.84 | $6.48 |
| Emery paper | 9.90 | 11.00 | 8.80 |
| Emery cloth | 31.12 | 31.12 | 29.48 |
| Emery disks, 6 in. dia., No. 1 grade, per 100: | | | |
| Paper | 1.49 | 1.24 | 1.40 |
| Cloth | 3.38 | 2.67 | 3.20 |
| Fire clay, per 100 lb. bag | | .65 | .60 |
| Coke, prompt furnace, Connellsville | per net ton | | 4.00@4.40 |
| Coke, prompt foundry, Connellsville | per net ton | | 5.25@6.50 |
| White lead, dry or in oil | 100 lb. kegs | | New York, 14.00 |
| Red lead, dry | 100 lb. kegs | | New York, 14.00 |
| Red lead, in oil | 100 lb. kegs | | New York, 15.50 |

## *Comparative Warehouse Prices*

| New York | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.0354 | $0.0354 | $0.0304 |
| Cold finished shafting | per lb. | 0.044 | 0.0465 | 0.039 |
| Brass rods | per lb | 0.155 | 0.155 | 0.17 |
| Solder (½ and ½) | per lb. | 0.3375 | 0.325 | 0.275 |
| Cotton waste | per lb. | .11@.14 | .10@.13 | .09@.11½ |
| Washers, cast iron (½ in.) | per 100 lb. | 6.50 | 6.50 | 6.00 |
| Emery, disks, cloth, No. 1, 6 in. dia. | per 100 | 3.38 | 3.38 | 3.02 |
| Lard cutting oil | per gal. | 0.55 | 0.55 | 0.50 |
| Machine oil | per gal. | 0.29 | 0.297 | 0.33 |
| Belting, leather, medium | off list | 30–10% | 30–10% | 30–10% |
| Machine bolts up to 1x30 in. | off list | 45% | 45% | 40% |

## SHOP SUPPLIES

Current Discounts from Standard Lists

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Machine Bolts: | | | |
| All sizes up to 1x30 in. | 45% | 60% | 50–5% |
| 1⅛ and 1¼x3 in. up to 12 in | 15% | 50–5% | 50% |
| With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%) | 30% | $3.50 net | |
| With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%) | 35% | 3.50 net | $4.00 off |
| Button head bolts, with hex. nuts | List net | List net | |
| Hex. head and hex. nut bolts | List net | | 65–5% |
| Lag screws, coach screws | 45% | | 60–5% |
| Square and hex. head cap screws | 60% | 70% | 70–10% |
| Carriage bolts, up to 1 in.x30 in. | 35% | 50% | 50–5% |
| Bolt ends, with hot pressed nuts | 45% | | 55% |
| Tap bolts, hex. head, list plus | 35% | | |
| Semi-finished nuts, 9/16 and smaller | 65% | | |
| Semi-finished nuts, ⅝ and larger | 60% | 70% | 80% |
| Case-hardened nuts | 50% | | |
| Washers, cast iron, ½ in., per 100 lb. (net) | $6.50 | $4.00 | $4.00 |
| Washers, cast iron, ⅝ in., per 100 lb. (net) | 5.50 | 4.00 | 4.00 |
| Washers, round plate, per 100 lb. Off list | 1.50 | 4.00 | 4.00 |
| Nuts, hot pressed, sq., per 100 lb. Off list | 1.00 | 3.50 | 3.50 |
| Nuts, hot pressed, hex., per 100 lb. Off list | 1.00 | 3.50 | 3.50 |
| Nuts, cold punched, sq., per 100 lb. Off list | 1.00 | 3.50 | 3.50 |
| Nuts, cold punched, hex., per 100 lb. Off list | 1.00 | 3.50 | 3.50 |
| Rivets: | | | |
| Rivets, 7/16 in. dia. and smaller | 50% | 60% | 60% |
| Rivets, tinned | 50% | 60% | 4½c. net |
| Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net) | $5.00 | $3.60 | $3.75 |
| Cone heads, ditto (net) | 5.20 | 3.80 | 3.85 |
| 1½ to 2-in. long, all diameters, *EXTRA* per 100 lb. | 0.25 | | 0.15 |
| ⅝ in. diameter *EXTRA* | 0.35 | | 0.15 |
| ½ in. diameter *EXTRA* | 0.75 | | 0.50 |
| 1 in. long, and shorter *EXTRA* | 0.75 | | 0.50 |
| Longer than 5 in. *EXTRA* | 0.50 | | 0.25 |
| Less than 200 lb. *EXTRA* | 0.50 | | 0.50 |
| Countersunk heads *EXTRA* | 0.45 | | $3.70 base |

**Que., Montmagny**—Thibault, Ltd., R. Thibault, Purch. Agt.—machinery and equipment for sash and door factory.

**Que., Montreal**—A. Archambault, 3520 Henri Julien Ave.—general foundry equipment.

**Que., Montreal**—J. Date, 15 Concord St.—machinery and equipment for brass foundry.

**Que., Montreal**—R. Jubinville, 264 Visitation St. (printer)—paper cutter, etc.

**Que., Montreal**—E. Leger, 90 Monk Blvd. (printer) — paper cutter, pulleys and shafting.

**Que., Montreal**—Persky & Co., 1 De Montigny St. E., S. P. Persky, Purch. Agt.—job printing press, belting, hangers, etc.

**Que., Montreal**—T. Rogers, 1761 Iberville St.—crushing and screening machinery for quarry.

**Que., Montreal**—O. Tremblay, 331 Garnier St.—compressor and pump for garage.

**Que., St. Donat**—L. Pelletier—sawmill equipment.

## Metal Working Shops

**Ala., Decatur** — The H. & H. Machine Wks., 1st Ave., plans to build a plant.

**Calif., Emeryville** — Cozzens-Ball, Inc., San Pablo St. and 48th Ave., is receiving bids for the construction of a 1 story garage. Estimated cost $80,000. F. Soderberg, 276 Perkins St., Oakland, Archt. Noted Dec. 27.

**Calif., Emeryville** — The Westinghouse Electric Co., 62nd and Powell Sts., is receiving bids for the construction of a 3 story factory. Cost will exceed $150,000. B. H. Prack, 62nd and Green Sts., Emeryville, Engr.

**Calif., Long Beach**—The Soft Water Laundry Co., 700 Anaheim St., awarded the contract for the construction of a 1 story, 30 x 125 ft. garage.

**Calif., Long Beach**—H. S. Wright, c/o J. H. Roberts, Archt., Marine Bank Bldg., is having plans prepared for the construction of a 2 story, 50 x 150 ft. garage and office building on American Ave.

**Calif., Los Angeles**—The California Co., 626 South Spring St., awarded the contract for the construction of a 1 story, 110 x 135 ft. garage on Temple St. near Alvarado St. Checker Taxi Cab Co., 846 Bway., lessee.

**Calif., Los Angeles**—J. L. Grant, c/o J. M. Cooper, Archt. and Contr., Marsh Strong Bldg., awarded the contract for the construction of a 1 story, 60 x 150 ft. garage on Flower St. near Pico St.

**Calif., Los Angeles**—R. B. Lloyd, Bank of Italy Bldg., awarded the contract for the construction of a 1 story, 60 x 80 ft. addition to garage on Vermont Ave.

**Calif., Los Angeles**—The J. A. Nadeau Co., 1100 East Slauson Ave., is having plans prepared for the construction of a 1 story addition to garage. Estimated cost $40,000. A. G. Bailey, Jr., Orpheum Bldg., Los Angeles, Archt.

**Calif., Los Angeles**—J. B. Newman c/o V. P. Gilbert, Contr., 705 Citizens Natl. Bank Bldg., awarded the contract for the construction of a 1 story, 100 x 200 ft. garage on H and 9th Sts.

**Calif., Los Angeles**—K. O'Mara, c/o A. C. Martin, Archt., Higgins Bldg., is having plans prepared for the construction of a 3 story, 60 x 150 ft. garage on Grand Ave

**Calif., Los Angeles**—The Stockham Pipe & Fitting Co., Terminal Sales Bldg., has had plans prepared for the construction of a 1 story pipe shop on 24th St. Estimated cost $40,000. F. D. Chase, Title Insurance Bldg., Los Angeles, Archt.

**Calif., Los Angeles**—M. Swasey, Archt., Hibernian Bldg., is receiving bids for the construction of a 2 story, 115 x 150 ft. garage on Gordon and Sunset Sts., for S. W. Smith, 1620 South Figueroa St.

**Calif., Marysville**—The Pacific Gas & Electric Co., 445 Sutter St., San Francisco, will have plans prepared for the construction of garage, shop and warehouse buildings on A St., here. Cost will exceed $40,000. Private plans.

**Calif., Newman** — The Orestimba High School Dist. plans to build a machine shop. Estimated cost $5,000.

**Calif., Venice**—The Jennings-White Mfg. Co., c/o J. C. Barthel, 119 Wavecrest Ave., Santa Monica, plans to build a factory for the manufacture of automobile accessories, here. Cost will exceed $150,000.

**Calif., Ventura**—Cerfoglio & Bogetti, c/o A. C. Martin, Archt., Higgins Bldg., Los Angeles, are having plans prepared for the construction of a 1 story, 100 x 125 ft. garage, here.

**Ind., Kokomo**—The Standard Sanitary Mfg. Co., manufacturer of enameled ironware, brass, etc., is having plans prepared for the construction of a 1 story, 100 x 580 ft. addition to its plant. Estimated cost $100,000. E. E. Dunlap Co., 1125 North Buckeye St., Kokomo, Archts.

**Mass., New Bedford** — The Continental Wood Screw Co., Inc., Mount Pleasant St., plans to build a 50 x 100 ft. addition to machine shop. Estimated cost $45,000, including equipment.

**Mich., Detroit**—The Detroit Motor Bus Co., Terminal and Edlie Sts., awarded the contract for the construction of a 1 and 2 story shop, office building and pump house on Dexter Blvd. Estimated cost $300,000.

**Minn., St. Paul**—The Studebaker Sales Co., 9th and Franklin Sts., awarded the cotract for the construction of a 3 story, 60 x 80 ft. addition to garage. Estimated cost $60,000.

**Mo., Carthage**—Liggett & Platt, 219 West 2nd St., are having preliminary plans prepared for the construction of a 1 story, 80 x 400 ft. factory for the manufacture of bed springs. Estimated cost $50,000. P. K. Simpson, Custer Bldg., Carthage, Archt. Noted July 19.

**Mo., Kansas City**—The Ford Motor Co., Highland Park (Detroit P. O.), awarded the contract for 1 story, 200 x 840 ft. first section of assembly plant, here. Estimated cost $400,000, total cost $750,000. Noted Oct. 25.

**Mo., Kansas City**—The Treasury Dept., Wash., D. C., awarded the contract for the construction of a 2 story, 103 x 281 ft. garage for the United States Post Office, here. Estimated cost $150,000.

**Mo., St. Louis**—The Down Town Garage Co., c/o O. J. McCawley, 613 Chestnut St., is having preliminary plans prepared for the construction of a 3 story garage, 300 car capacity, on 7th St. Estimated cost $175,000. G. E. Wells, Boatmen's Bank Bldg., St. Louis, Engr. and Archt.

**Mo., St. Louis**—F. Dubinsky, Wainwright Bldg., will build a 1 story, 80 x 110 ft. garage and service building on Washington St. Estimated cost $40,000.

**Mo., St. Louis** — McNicol Bros., 5618 Easton Ave., will build a 1 story, 100 x 135 ft. garage on Blendon Pl. Estimated cost $40,000.

**N. Y., Buffalo**—The Kensington-Davis Corp., 144 Kensington Ave., is having plans prepared for the construction of a 1 story, 140 x 300 ft. foundry. Estimated cost $140,000. Austin Co., 16112 Euclid Ave., Cleveland, O., Archts.

**N. Y., Buffalo**—The Morrison Sheet Metal Wks., 26 East North St., is having plans prepared for the construction of a 2 story, 150 x 250 ft. factory on St. Paul St. Estimated cost $190,000. G. M. Wolfe, 1377 Main St., Buffalo, Archt.

**O., Cleveland**—The Auto Electrical Maintenance Co., c/o H. E. Page, 943 Chester Ave., awarded the contract for the construction of a 1 story, 62 x 278 ft. garage at 2332 Prospect Ave. Estimated cost $75,000.

**O., Cleveland**—The Ford Motor Co., Highland Park (Detroit P. O.), is having plans prepared for the construction of a 1 story, 300 x 1,000 ft. assembly plant, here. A. Kahn, 1000 Marquette Bldg., Detroit, Archt.

**O., Cleveland**—The Gluntz Brass Fdry. Co., 1629 East 55th St., awarded the contract for the construction of a 1 story, 60 x 100 ft. foundry. Estimated cost $40,000. D. J. Gluntz, Pres.

**O., Cleveland**—Horsburgh & Scott, 5114 Hamilton Ave., manufacturer of cut gears, awarded the contract for the construction of a 3 story, 120 x 140 ft. factory. Estimated cost $250,000. R. G. Horsburgh, Secy.

**O., Dayton**—The Duro Pump & Mfg. Co., East Monument Ave., is having plans prepared for the construction of a 4 story, 80 x 200 ft. factory for the manufacture of soft water pumping plants on Amelia St. Estimated cost $175,000. Schenk & Williams, Mutual Home Bldg., Dayton, Archts.

**O., Dayton**—E. F. Kimmel, Ludlow Bldg., awarded the contract for the construction of a 3 story, 66 x 130 ft. sales room and automobile repair shop on North Jefferson St. Estimated cost $100,000.

**Pa., Phila.**—S. W. Chapman, 3524 North 7th St., is having plans prepared for the construction of a 1 story, 62 x 64 ft. service station and garage on 5th and Bristol Sts. Estimated cost $30,000. W. F. B. Koelle, Otis Bldg., Phila., Archt.

**Pa., Phila.**—The Genl. Electric Co., River Rd., Schenectady, N. Y., awarded the contract for the construction of a 1 story, 125 x 250 ft. tank shop on 69th and Elmwood Sts., here. Estimated cost $200,000.

**Pa., Phila.**—R. J. Seltzer, 1423 Locust St., will build a 1 story, 50 x 265 ft. sales room and garage at 3427-29 North Broad St. Estimated cost $50,000.

**Pa., Phila.**—The Union Tank Car Co., 21 East 40th St., New York, will soon award the contract for the construction of a 1 story, 80 x 400 ft., and 60 x 240 ft. repair shop in Gallows Lane and Point Breeze, here. Estimated cost $350,000. Private plans.

**Pa., Wilkes-Barre** — A. W. Grebe, Carey Ave., awarded the contract for the construction of a 2 story, 100 x 180 ft. garage.

**R. I., Phillipsdale** (Branch of Providence) —The Amer. Electrical Wks. awarded the contract for the construction of a 1 story, 80 x 280 ft. factory for the manufacture of lead cables. Estimated cost $100,000.

**Tex., Galveston**—The J. Christiansen Co., Ave. I, has had plans prepared for the construction of a 1 story, 50 x 120 ft. garage. Estimated cost $45,000. D. N. McKenzie, 2107 Post Office St., Galveston, Engr. and Archt.

**Tex., Houston**—The Texas & New Orleans R.R., Southern Pacific Bldg., awarded the contract for the construction of concrete work for shops. Estimated cost $54,000.

**Wash., Seattle**—The Amer. Can Co., foot of Clay St., awarded the contract for the construction of a 5 story, 120 x 310 ft. addition to its factory to double capacity. Estimated cost $700,000.

**Wis., Appleton** — The Kurz Motor Co., 1107 College Ave., is receiving bids for the construction of a 2 story, 30 x 77 ft. and 26 x 42 ft. addition to garage. Estimated cost $40,000.

**Wis., Kenosha**—P. Pirsch & Co., Fairfield Ave., are receiving bids for the construction of a 1 story, 100 x 200 ft. factory for the manufacture of fire apparatus. Estimated cost $60,000. Private plans.

**Wis., Milwaukee**—The Argo Investment Co., 77 Michigan St., awarded the contract for the construction of a 2 story, 62 x 100 ft. garage on 5th St. Estimated cost $75,000.

**Ont., Welland**—Gram Bros., Division St., are having plans prepared for the construction of a 2 story garage. Estimated cost $50,000. N. A. Kearns, Temple Bldg., Welland, Archt.

For Special Opportunities—
*See pages 158-171*
—The SEARCHLIGHT SECTION